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# Results of Investigations, T. E. Maxson WTP (Wastewater Treatment Plant) and Significant Industrial Contributors, Memphis, Tennessee

Environmental Protection Agency, Athens, Georgia

Mar 77

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# RESULTS OF INVESTIGATIONS
# T. E. MAXSON WTP AND SIGNIFICANT INDUSTRIAL CONTRIBUTORS
# MEMPHIS, TENNESSEE

MARCH 1977
ENVIRONMENTAL PROTECTION AGENCY
SURVEILLANCE AND ANALYSIS DIVISION
ATHENS, GEORGIA

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The U.S. Environmental Protection Agency (EPA) Region IV Surveillance and Analysis Division, Water Surveillance and Ecology branches, conducted a case preparation study of the T.E. Maxson Wastewater Treatment Plant (WTP) and its contiguous sewerage system in Memphis, Tennessee during October 1976. The study included an operation and maintenance investigation of the plant, bioassay toxicity studies of the plant influent and effluent, and waste characterization studies of significant industrial wastewater contributors to the collection system. The study was specifically requested by the EPA Region IV Enforcement Division. The main objectives of the study were to: Determine the capability of the WTP to treat present and projected waste loads within the limits imposed by the current NPDES permit;Characterize significant waste sources currently discharging into the collection system; and verify data to be provided by the City's consultant, resulting from a Show Cause Hearing. This report presents the results of these studies.

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# RESULTS OF INVESTIGATIONS

# T. E. MAXSON WTP AND SIGNIFICANT INDUSTRIAL CONTRIBUTORS

# MEMPHIS, TENNESSEE

March 1977
Environmental Protection Agency
Surveillance and Analysis Division
Athens, Georgia

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# INTRODUCTION

The U.S. Environmental Protection Agency (EPA) Region IV Surveillance and Analysis Division, Water Surveillance and Ecology branches, conducted a case preparation study of the T. E. Maxson Wastewater Treatment Plant (WTP) and its contiguous sewerage system in Memphis, Tennessee during October 1976. The study included an operation and maintenance investigation of the plant, bioassay toxicity studies of the plant influent and effluent, and waste characterization studies of significant industrial wastewater contributors to the collection system. The study was specifically requested by the EPA Region IV Enforcement Division. The main objectives of the study were to:

- Determine the capability of the WTP to treat present and projected waste loads within the limits imposed by the current NPDES permit,
- Characterize significant waste sources currently discharging into the collection system, and
- Verify data to be provided by the City's consultant, resulting from a Show Cause Hearing.

The cooperation of the Tennessee Department of Public Health, the Memphis-Shelby County Health Department, and the City of Memphis is gratefully acknowledged.

## STUDY FINDINGS

The T. E. Maxson Wastewater Treatment Plant (WTP) was designed as an 80 mgd contact stabilization activated sludge system, and was placed into substantial operation in June, 1975. The WTP was designed for five-day biochemical oxygen demand ($BOD_5$) and total suspended solids (TSS) removal efficiencies of 85 and 90 percent, respectively. During the study, the plant was receiving wastewater only from the Nonconnah Creek Basin interceptor. Interceptors serving the Presidents Island area of Memphis (Presidents Island Interceptor) and a portion of Mississippi (Horn Lake Interceptor) will be connected to the WTP in the near future.

Study data show that the WTP was not meeting NPDES effluent limits. Average daily reductions in $BOD_5$, chemical oxygen demand (COD), and TSS were 69, 54, and 45 percent, respectively. The weekly average effluent concentrations for $BOD_5$ and TSS of 165 and 210 mg/l, respectively, exceeded the weekly average NPDES permit limitations of 45 mg/l. Wastewater flow into the WTP averaged 39 mgd (49 percent of design), and the organic loading ($BOD_5$) averaged 173,400 lbs/day (104 percent of the design loading of 166,000 lbs/day). For the 24-hour period October 21 through 22, 1976, the $BOD_5$ loading was 232,400 lbs/day (140 percent of the design loading). For short periods, such as on the morning of October 21, 1976, the design organic loading was exceeded to the extent that proper operation of the contact stabilization process was severely impeded. The organic ($BOD_5$) overloading problem will be significantly increased when the Presidents Island and Horn Lake interceptors are connected to the WTP.

Significant amounts of chlordane, chloroform, ramrod, and terpireol isomer were detected in the WTP influent. Approximate influent loadings of these four compounds were 846, 58.5, 86.2, and 58.5 lbs/day, respectively. Significant amounts of chlordane (976 lbs/day), chloroform (68.3 lbs/day), and ramrod (49.1 lbs/day) were also discharged from the WTP. Chlordane and chloroform are on EPA's Consent Decree, "65 Toxic Chemicals List".

Toxicity studies indicated that the influent and effluent wastewaters were toxic to waterfleas and bluegill sunfish. These tests showed that influent toxicity varied due to batch discharges and that toxicity was substantially reduced by the WTP process. Because of the complex makeup of the wastewater, it is difficult to determine the exact compound, or group of compounds causing this toxicity. However, compounds such as chlordane and atrazine, which were detected in the wastewater, have been documented as causative agents in acute toxicity by other investigators.

Major WTP operational problems detected during the study are as follows:

1. The air supply was insufficient for proper operation of both the contact stabilization process and digesters. Normally, two, and occasionally three, of the five air compressors (maximum output 42,000 cfm each) were operated. The average influent $BOD_5$ loading of 173,400 lbs/day required an air supply of 102,300 cfm for the operation of the contact stabilization process (assuming 85 percent removal and 1,000 cfm/lb $BOD_5$).
2. The 13 acre sludge lagoon is an emergency type sludge holding facility, and cannot function as the sole sludge disposal mechanism.

3. The WTP receives untreated wastewaters from unregulated industrial discharges which produce shock loadings and keep the process continually upset. Batch discharges were common, as evidenced by wide variation in the influent pH and the extremely high organic loadings.
4. The WTP was understaffed. One operator per shift cannot adequately control a WTP of this size and complexity, especially when automated equipment is not fully operational.
5. Flow was restricted between the reaeration and contact basins. The maximum return sludge rate attained under typical operating conditions has been approximately 20 mgd (25 percent of design). The treatment system was designed for a 60 mgd (75 percent of design) return sludge rate. Under these restricted hydraulic conditions, the WTP cannot be properly operated at design flow.
6. Numerous mechanical problems with items such as the blowers, influent pumps, clarifier sludge removal equipment, etc., have resulted in an excessively long shakedown period.
7. Electrical power failures have caused severe operational problems. During the survey, a defective area light caused a power failure which shut down the central control computer and caused the subsequent loss of control power to the blowers, pumps, etc., totally shutting down the WTP. The WTP was without power for approximately one and one-half hours. The computer was down for over six hours.
8. Observation of the clarifiers indicated that the magnetic flowmeters were producing erroneous readings. Proper operation of the numerous flowmeters in the WTP is vital to optimum efficiency and automatic operation of the facility.

9. Only five of the eight final clarifiers were in service. A subcontractor was stripping and repainting all of the metal work in each clarifier, and a new grout bottom had just been completed in one of them.

10. Maximum aeration basin utilization was only 60 percent of the total available capacity. The number of basins utilized were selected to match hydraulic loading rather than organic loading conditions.

11. Maximum utilization of the sludge thickeners is essential to conserve digester space.

12. The chlorine supply was depleted on October 14, 1976, and the effluent stream was not disinfected during the duration of the study.

13. Effluent weirs on four of the five clarifiers were out of level.

The industrial wastewater dischargers investigated during this study were selected from a list of 162 which were discharging into the T. E. Maxson WTP from the Nonconnah Creek Basin Interceptor. From this list, 73 sources were selected for on-site reconnaissance inspections by study personnel. Those sources not inspected discharged only cooling water, sanitary wastewater, or insignificant volumes of process wastewater. As a direct result of the on-site inspections, thirty-six industrial sources were selected for investigation.

A reconnaissance inspection was also made of the industries located on and adjacent to Presidents Island during the week of October 25, 1976. As a result of these inspections, ten sources were selected for investigation. These industries discharged wastewaters into the Presidents Island Interceptor which presently discharges into the Mississippi River without treatment. This interceptor will be connected to the WTP in the near future.

The Horn Lake Interceptor, which, when completed, will transport wastewaters from northern Mississippi, will not serve any significant industrial sources, and was not investigated.

The thirty-six Nonconnah Creek Basin industries were sampled for two or more days during October 18 through 23, 1976. Seventeen of the thirty-six sources contributed more than one percent of the influent load of at least one measured pollutant discharged into the WTP during the study. These sources contributed 48 percent of the $BOD_5$ (99,100 lbs/day), 48 percent of the COD (178,000 lbs/day), and 36 percent of the TSS (42,500 lbs/day) loads discharged into the WTP during the study. Those sources responsible for the bulk of the influent industrial waste load included: $BOD_5$ (41 percent) - Schlitz Brewing Company, Ralston Purina, Valley Products, and Hunt Wesson Foods; COD (43 percent) - Schlitz Brewing Company, Ralston Purina, and Valley Products; TSS (34 percent) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods, Frito-Lay, and Kellogg. The Nonconnah Creek Basin sources accounted for the following percentages of the indicated heavy metals that were discharged into the treatment plant: chromium and cadmium (100 percent), zinc (52 percent), nickel (22 percent), lead (11 percent), and copper (8 percent). Seven industries discharged organic compounds included in EPA's Consent Decree, "65 Toxic Chemicals List" as follows:

| DISCHARGER | ORGANIC COMPOUND |
|---|---|
| Pro-Serv | chloroform trichloroethylene, toluene, ethyl benzene, methylene chloride |

| DISCHARGER | ORGANIC COMPOUND |
|---|---|
| National Starch and Chemical Company | trichloroethylene, methylene chloride, butyl benzyl phthalate, phenol |
| Chapman Chemical Company | benzene, methylene chloride |
| Delta Refining Company | phenol |
| Delta Foremost Chemical Co. | phenol |
| Hunt Wesson Foods, Inc. | phenol |
| Shulton, Inc. | diethyl phthalate |

The only industrial source that deliberately "batch" discharged wastewater was the Pro-Serv Company. However, results of the operation and maintenance and toxicity studies conducted at the WTP indicated that many other sources were probably "batch" discharging wastewater.

Several industrial dischargers relied on septic tank cleaning services to maintain their discharge sumps. In most cases, company personnel did not know how or where the collected wastes were discharged. If these wastes are discharged into the WTP sewer system, this could represent a significant pollutant load.

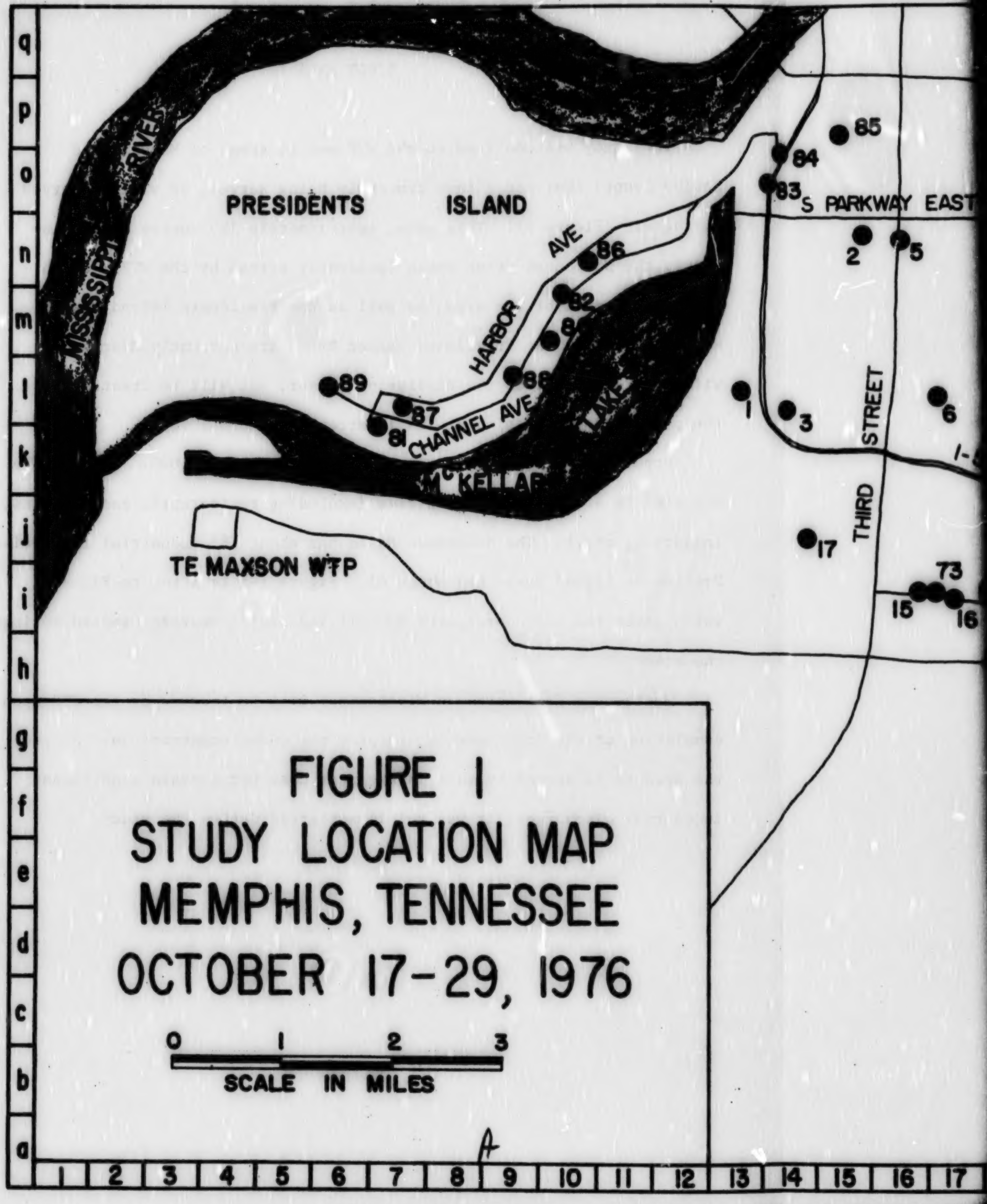
The ten Presidents Island Basin industrial sources were sampled during October 25 through 28, 1976. The waste loads of $BOD_5$ (15,000 lbs/day), COD (82,000 lbs/day), and TSS (21,000 lbs/day) discharged by these sources represented approximately 20 percent of the total load currently discharged into the WTP. Of the ten sources sampled, the Cargill Corn Syrup plant and the Armour Company accounted for 94 percent of the $BOD_5$, COD, and total Kjeldahl nitrogen (TKN), plus 92 percent of the TSS discharged. The chromium discharged from these sources exceeded the amount currently discharged to the WTP. The zinc discharged was approximately one-third of the current WTP influent loading. When this interceptor is connected to the WTP, it will significantly increase the current organic ($BOD_5$) loading on the plant and add to the existing WTP operational problems.

## STUDY AREA

The study was confined to the WTP and to areas of Memphis and Shelby County that are either presently being served, or will be served by the WTP (Figure 1). This area, approximately 190 square miles, includes the Nonconnah Creek Basin (presently served by the WTP), which encompasses most of the area, as well as the Presidents Island Basin. Wastewaters from the Presidents Island Basin are currently discharged without treatment into the Mississippi River, but will be treated at the plant upon completion of its interceptor.

Population of the study area is approximately 300,000. The area is occupied by at least 210 industries (excluding restaurants, gas stations, laundries, etc.). The Nonconnah Basin has about 165 industrial facilities; Presidents Island Basin has about 45. Figure 1-A is a key to Figure 1 which gives the map coordinates for all industrial sources sampled during the study.

Wastewater from northern Mississippi will be treated at the WTP upon completion of the Horn Lake interceptor now under construction. Since the area to be served by this interceptor does not contain significant industrial discharges, it was not investigated during the study.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MISSISSIPPI RIVER
HARBOR AVE
CHANNEL AVE
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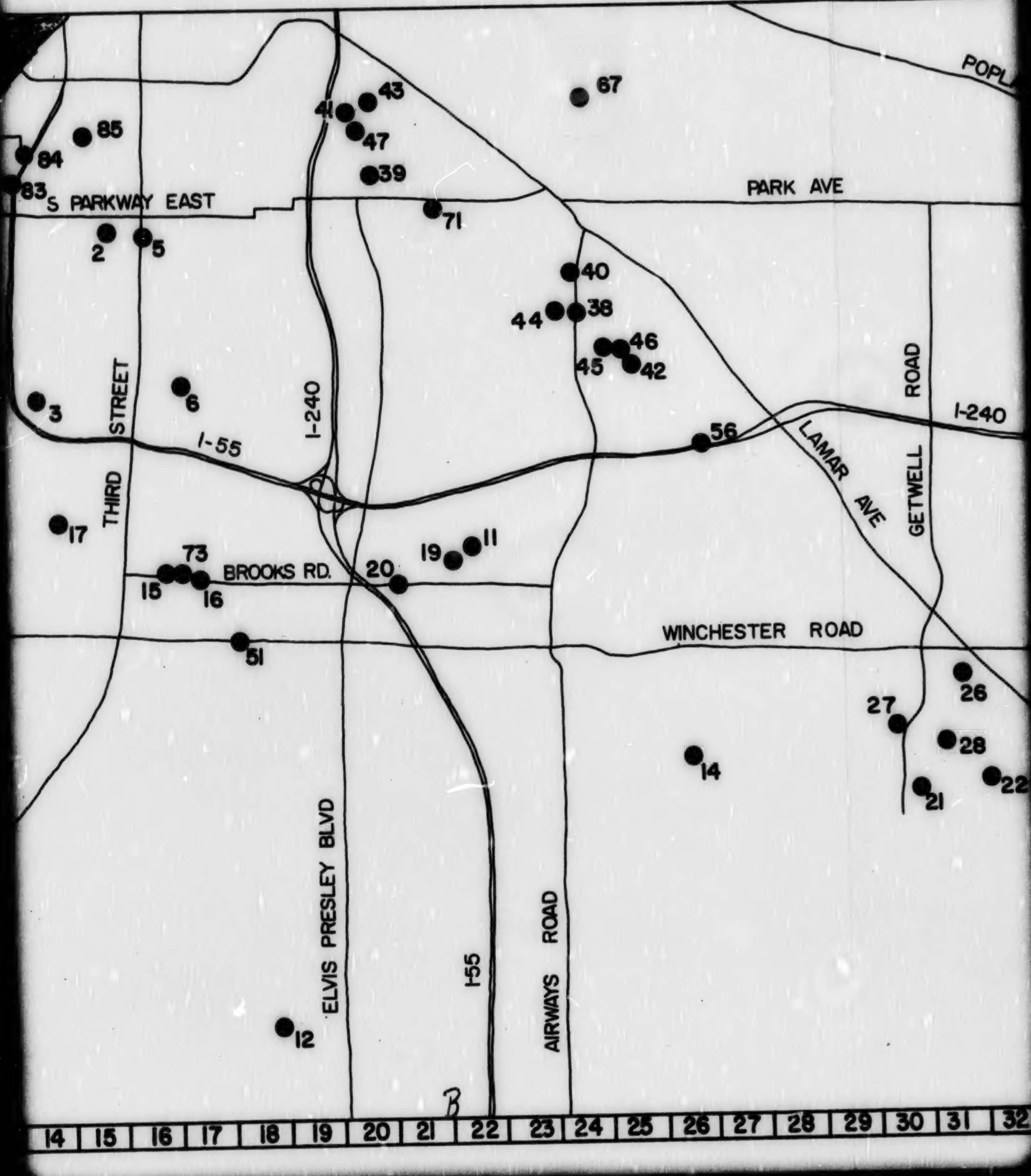
FIGURE 1
STUDY LOCATION MAP
MEMPHIS, TENNESSEE
OCTOBER 17-29, 1976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S PARKWAY EAST
THIRD STREET
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I-55
I-240
LAMAR AVE
GETWELL ROAD
BROOKS RD.
WINCHESTER ROAD
ELVIS PRESLEY BLVD
I-55
AIRWAYS ROAD
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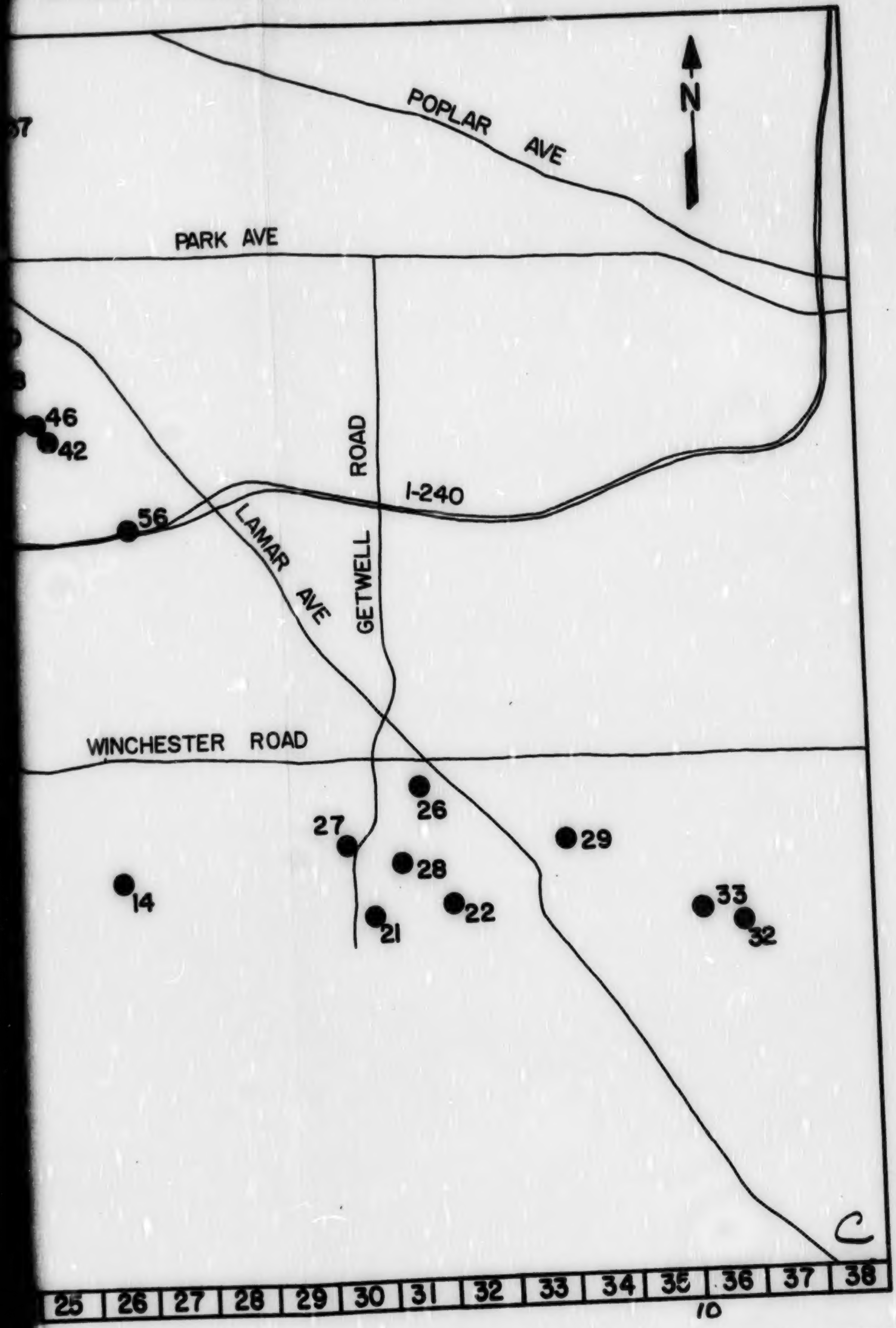
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## FIGURE 1-A

## INDUSTRY MAP KEY
## MEMPHIS, TENNESSEE

October, 1976

| INDUSTRY NO. | NAME | MAP COORDINATES |
|---|---|---|
| 1. | Delta Refining Corp. | L-13 |
| 2. | Kimco Auto Products, Inc. | N-15 |
| 3. | Refined Metals Corp. | L-14 |
| 5. | Shulton, Inc. | N-16 |
| 6. | United Paint Co., Inc. | L-17 |
| 11. | Dixie Litho Plating, Inc. | J-22 |
| 12. | Alco-Gravure, Inc. | B-18 |
| 14. | Quality Industrial Uniform Service | F-26 |
| 15. | Valley Products Co. | I-16 |
| 16. | Champman Chemical Co. | I-17 |
| 17. | Illinois Central RR | J-14 |
| 19. | Rainbo Photo Service, Inc | I-22 |
| 20. | Richards Mfg. Company | I-21 |
| 21. | National Starch & Chemical Corp. | F-30 |
| 22. | Utrex Incorporated | F-32 |
| 26. | Cleo Wrap Corp. | G-31 |
| 27. | D&W Plating Co. | G-27 |
| 28. | Delta Foremost Chemical Corp. | F-31 |
| 29. | J. M. Smucker Co. | G-34 |
| 32. | Ralston Purina Co. | E-37 |
| 33. | Jos. Schlitz Brewing Co. | F-36 |
| 38. | Frito-Lay, Inc. | M-24 |
| 39. | General Cable Corp. | O-20 |
| 40. | Gould, Inc. | N-24 |
| 41. | High's Ice Cream Novelties, Inc | P-20 |
| 42. | Hunter Fan & Ventillating Company | L-25 |
| 43. | Hunt Wesson Foods, Inc. | P-20 |
| 44. | Kellogg Company | M-24 |
| 45. | The Kroger Co. | L-25 |
| 46. | Memphis Furniture Co. | L-25 |
| 47. | Midwest Farms | P-20 |
| 51. | Crown Zellerback Corp. | H-18 |
| 56. | Klinke Bros. Ice Cream Co. | K-26 |
| 67. | Keathleys | P-24 |
| 71. | J. Strickland & Co. | N-71 |
| 73. | Pro-Serve, Inc. | J-17 |
| 80. | Cargill, Inc. | M-10 |
| 81. | Cargill, Inc. | K-7 |
| 82. | Mid-South Plating Co., Inc. | M-10 |
| 83. | Armour Corp. | O-14 |
| 84. | Memphis Butchers | O-14 |

| INDUSTRY NO. | NAME | MAP COORDINATES |
|---|---|---|
| 85. | Unarco Industries, Inc | P-15 |
| 86. | Buring Food Group, Inc | N-11 |
| 87. | Faith-Memphis Plating Co. | L-7 |
| 88. | Miller Transporters, Inc | L-9 |
| 89. | CBI Nuclear Corp. | L-6 |

# RESULTS AND DISCUSSION

Results in the following areas are presented and discussed in this portion of the report: (1) operation and maintenance investigations; (2) toxic bioassay studies of influent and effluent wastewater streams, and (3) waste characterization studies of significant industrial contributors.

## T.E. MAXSON WASTEWATER TREATMENT PLANT

This section deals with findings of operation and maintenance investigations conducted at the WTP October 18 through 25, 1976. Methods employed during this study included extensive sampling, physical measurements, and daily observation of WTP operations. The specific objectives were to:

(1) Evaluate wastewater treatment through control testing and examination of operational practices;

(2) Determine influent and effluent wastewater characteristics, and

(3) Compare design and current wastewater loadings.

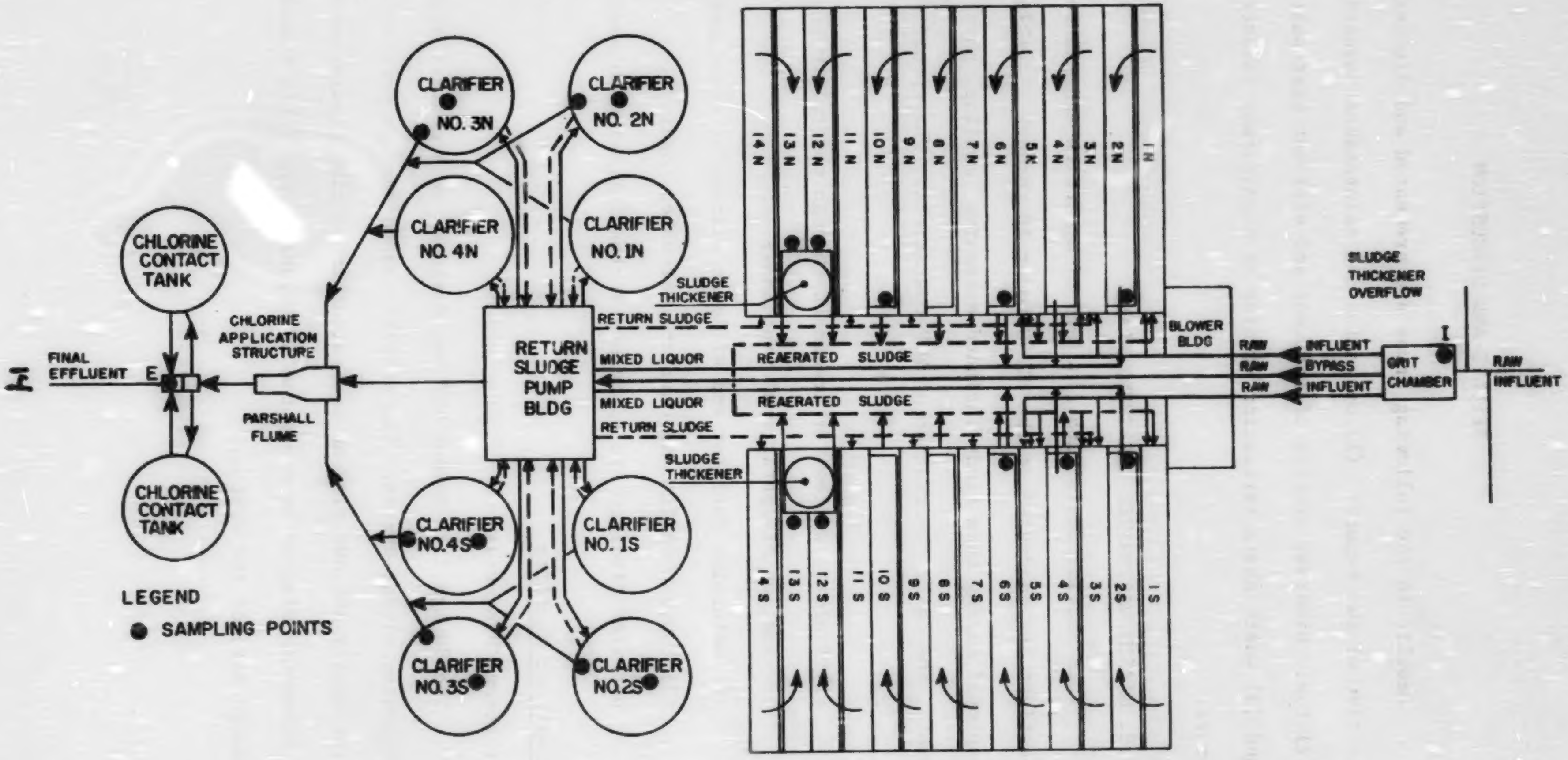
Detailed findings are discussed in the following subsections.

### Treatment Facility

#### Treatment Processes--

The 80 mgd T.E. Maxson WTP was designed as a contact stabilization activated sludge system. Its purpose was to serve a population of approximately 480,000 plus an equivalent industrial population of 495,000. A schematic diagram is presented in Figure 2, and Table I enumerates the design data of the system.

FIGURE 2
T. E. MAXSON WTP
MEMPHIS, TENNESSEE


CLARIFIER NO. 3N
CLARIFIER NO. 2N
CLARIFIER NO. 4N
CLARIFIER NO. 1N
CLARIFIER NO. 4S
CLARIFIER NO. 1S
CLARIFIER NO. 3S
CLARIFIER NO. 2S
CHLORINE CONTACT TANK
CHLORINE CONTACT TANK
CHLORINE APPLICATION STRUCTURE
PARSHALL FLUME
FINAL EFFLUENT
E
RETURN SLUDGE PUMP BLDG
SLUDGE THICKENER
RETURN SLUDGE
MIXED LIQUOR
REAERATED SLUDGE
MIXED LIQUOR
REAERATED SLUDGE
RETURN SLUDGE
SLUDGE THICKENER
14 N
13 N
12 N
11 N
10 N
9 N
8 N
7 N
6 N
5K
4 N
3 N
2 N
1 N
14 S
13 S
12 S
11 S
10 S
9S
8S
7 S
6S
5S
4S
3S
2S
1S
BLOWER BLDG
RAW INFLUENT
RAW BYPASS
RAW INFLUENT
GRIT CHAMBER
I
SLUDGE THICKENER OVERFLOW
RAW INFLUENT
LEGEND
● SAMPLING POINTS

# TABLE I

## DESIGN DATA*

## T. E. MAXSON WASTEWATER TREATMENT PLANT

## MEMPHIS, TENNESSEE

### I. General Design

| | |
|---|---|
| Design year | 1985 |
| Population | 480,000 |
| Industrial Equivalent Population | 495,000 |
| Total Equivalent Population | 975,000 |
| Average Flow | 80 mgd |
| Peak Flow | 150 mgd |
| BOD | 166,000 lbs/day |
| Suspended Solids | 195,000 lbs/day |

### II. Flow Measurements

| | |
|---|---|
| Influent | Magnetic meter, recorder, totalizer |
| Effluent | Parshall flume, indicator, totalizer |
| Return Sludge | Magnetic meter |
| Waste Sludge | Magnetic meter |
| Digester recycle | Magnetic meter |
| Waste Sludge (thickener) | Magnetic meter |

### III. Preliminary Treatment

| | |
|---|---|
| Bar Screens | Mechanically Cleaned |
| Comminutors (3) | |
| Capacity (each) | 72 mgd |
| Grit Chambers (4) | |
| Surface Area (each) | 800 sq.ft. |
| Surface Loading | 25,000 gpd/sq.ft. |
| Detention Time | 4.8 minutes |

### IV. Contact Basins

| | |
|---|---|
| Number | 4 sets** |
| Volume (per set) | 179,000 cu.ft. |
| | 1,339,000 gals |
| Aeration (diffused air) | |
| Number diffuser (per set) | 20 "Z shaped" |
| Air Requirements | 722,000 cu.ft./hr. |
| Average Flows (plus RS) | 35 mgd |
| Detention Time | 0.86 hrs. |

### V. Reaeration Basins

| | |
|---|---|
| Number | 6 sets** |
| Volume (set) | 179,000 cu.ft.<br>1,339,000 gals. |
| Average Flow | 7.5 mgd |
| Detention Time | 4.0 hrs. |

### VI. Final Clarifiers

| | |
|---|---|
| Number | 8 |
| Diameter | 135 ft. |
| Area | 14,300 sq.ft. |
| Volume | 214,500 cu.ft.<br>1,604,500 gals. |
| Surface Loading | 700 gpd/sq.ft. |
| Overflow Rate | 13,500 gpd/lin.ft. |
| Detention Time | 3.85 hrs. |
| Depth | 15 ft. |
| Weir Length | 756.72 ft. |

### VII. Chlorination

| | |
|---|---|
| Chlorine Contact Chambers (2) | |
| Diameter | 120 ft. |
| Surface Area | 11,300 sq.ft. |
| Detention Time | 0.5 hrs. |
| Volume | 113,000 cu.ft. |
| Chlorinators | 3 |
| Evaporator | 2 |

### VIII. Aerobic Digestion

| | |
|---|---|
| Number | 4 sets |
| Volume | 159,100 cu.ft.<br>1,190,000 gals. |
| Aeration | diffused air |
| Detention Time | 16 - 18 days |

### IX. Sludge Thickener

| | |
|---|---|
| Number | 2 |
| Area | 2,400 sq.ft. |
| Depth | 8 ft. |
| Solids Loading | 6 lbs/sq.ft./day |
| Surface Loading | 750 gals/sq.ft. |
| Volume | 143,626 gals. |

### X. Sludge Lagoon

| | |
|---|---|
| Area*** | 13 acres<br>653,400 sq.ft. |
| Depth | 20 ft. |
| Volume | 9,296,400 cu.ft.<br>69,537,000 gals. |

### XI. Pumping Facility

| | |
|---|---|
| Raw Sewage | 700 H.P. |
| 3 variable speed | 35,000 gpm @ 63 ft. TDH @ 417 rpm |
| 1 constant speed | 35,000 gpm @ 63 ft. TDH @ 440 rpm |
| Return Sludge | 125 H.P. |
| 6 variable speed | 12,000 gpm @ 85 ft. TDH<br>3,000 gpm @ 6 ft. TDH |
| Digested Sludge | 50 H.P. |
| 4 variable speed | 500 gpm @ 85 ft. TDH<br>300 gpm @ 31 ft. TDH |
| Air Lift | |
| 4 constant speed | 500 gpm @ 3.75 ft. TDH |
| Scum | 7.5 H.P. |
| 4 constant speed | 100 gpm @ 85 ft. TDH |

### XII. Aeration Equipment

| | |
|---|---|
| Air Compressors | 5 |
| Capacity | 42,000 cfm each |

---

* Design data reprint from the Memphis Public Relation Brochure, T. E. Maxson WTP, and engineering design drawings.

** Four sets of basins can be used interchangeably for either contact or reaeration basins.

*** Data calculated using dimensions on construction plans.

Influent wastewater passed through mechanically cleaned bar screens. It was then pumped to three comminutors and four aerated grit chambers. Wastewater flowed from the grit chambers by gravity into the contact basins, the clarifiers, and the chlorine contact chambers. Chlorine was added at the Parshall flume prior to discharge into the two contact chambers. Effluent from each chamber combined and discharged into the Mississippi River via the cooling water channel at the TVA power plant.

Return sludge from the clarifiers was pumped into the reaeration basins and flowed by gravity into the contact basins. Waste sludge was pumped from the clarifiers into the aerobic digesters. Sludge flowed from the digesters into sludge thickeners and was pumped into a 13 acre sludge lagoon. Sludge thickener supernatant can be pumped (air lift) into the aerobic digester or into the WTP head works. Aeration basin utilization was 60 percent, and only five of eight clarifiers were in operation during the study.

Personnel--

The WTP was staffed by 42 persons. According to an O&M report by the Tennessee Department of Public Health, these employees represent 65 percent of the total work force recommended for its operation(1). If all the automated equipment were operating properly, manpower requirements could be reduced from recommended levels. The current staff breakdown represents the following recommended staffing:

| POSITION | NO. EMPLOYED | RECOMMENDED STAFFING |
|---|---|---|
| Operators | 5 | 10 |
| Laboratory technicians | 4 | 5 |
| Clerks | 1 | 3 |

| POSITION | NO. EMPLOYED | RECOMMENDED STAFFING |
|---|---|---|
| Maintenance personnel | 27 | 38 |
| Management Supervisor | 1 | 4 |
| Laborers | 4 | - |
| Others | - | 5 |
| TOTAL | 42 | 65 |

## Study Results and Observations

A complete listing of all analytical data and general study methods are presented in the Appendices.

Numerous mechanical and electrical problems have interfered with plant operations since its start-up. According to City officials, the City has had difficulty in working with the contractor and suppliers on matters regarding equipment and construction deficiencies. Examples of major WTP components which have caused problems in the past and are currently causing problems are discussed below:

(1) The central control system was not fully operational. In addition, there was a shortage of operators. The combination of these two factors made it difficult to balance and properly control WTP processes.

(2) All three of the variable speed raw sewage pumps have presented problems. The malfunction of any two of these units prevents proper regulation of influent wastewater flow.

(3) Several of the blowers have been temporarily out of service

due to improper alignment, excessive vibration, and deterioration of electrical insulation.

(4) The cooling system on the return sludge pumps prevented low speed operation of these variable speed pumps.

(5) Electrical wiring problems existed within the WTP. In one instance, a shorted light fixture caused complete WTP shutdown, since controls for equipment such as pumps, blower, computer, etc. were all wired to the same electrical bus.

Other results and observations are discussed in the following subsections.

### Flow--

Influent flow was measured by magnetic flowmeters installed in the influent lines. These average flows are illustrated in Figure 3. Effluent wastewater flowed through a 10 foot Parshall flume located just prior to the chlorine contact chamber. This flume, however, was not used to measure effluent flow since the effluent was deliberately backed up in the flume to prevent cavitation of pumps immediately following the flume. These pumps are used to recycle effluent for cooling and other inplant uses where potable water is not required. The raw wastewater flow averaged 39 mgd; the minimum flow was 8.0 mgd, and the maximum flow was 87.6 mgd.

The daily rainfall in the Memphis area is detailed in Table II. Data presented in Figure 3 seemingly indicates a fairly uniform daily hydraulic load on the WTP. The heavy rainfall on October 23 through 25, however, increased the weekend flow. The increased flow, due to rainfall, was also apparent during the weekdays of October 19 through 20.

## TABLE II

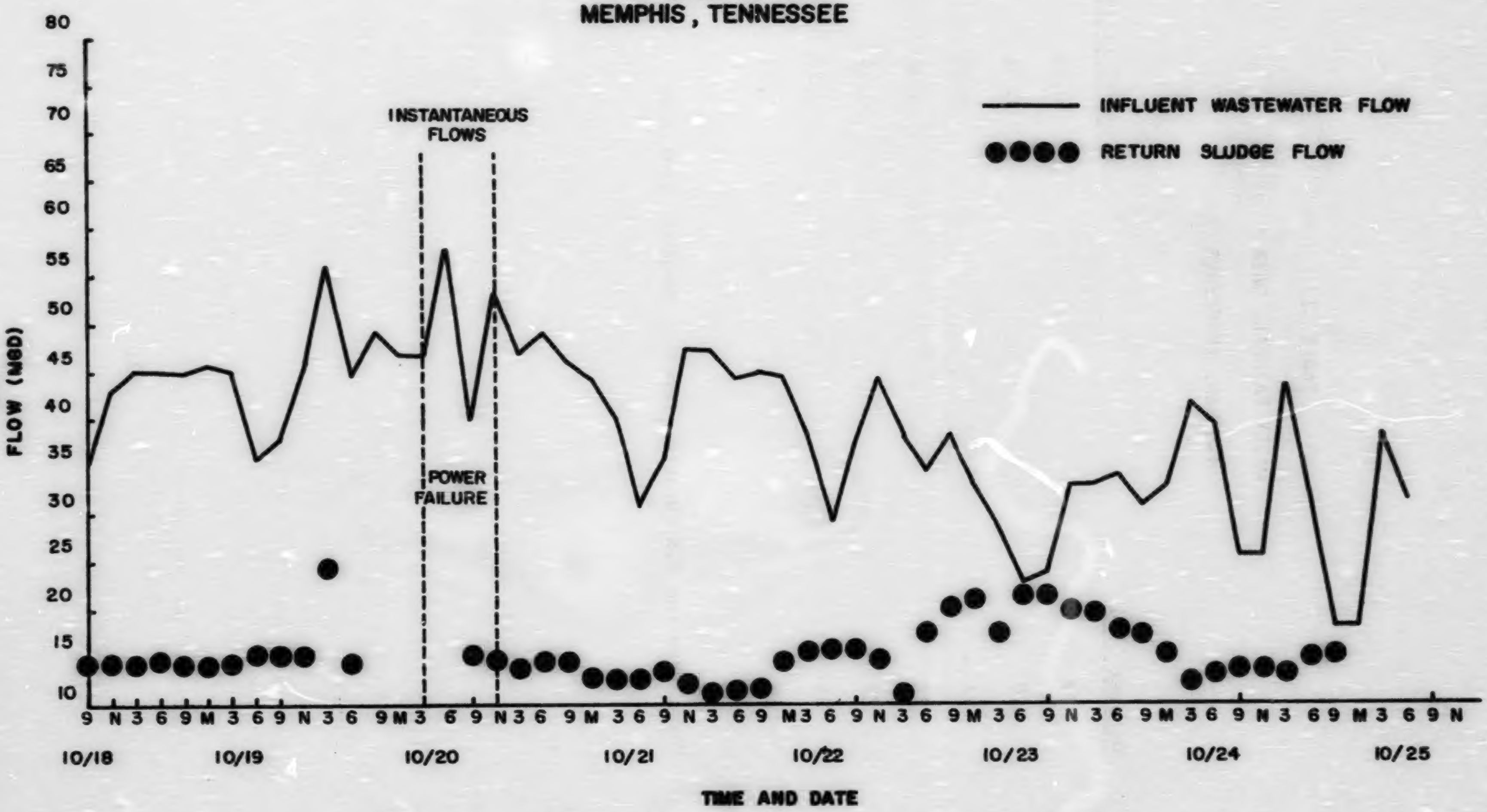
## DAILY RAINFALL DATA *

## MEMPHIS, TENNESSEE

| October 1976 | Rainfall (Inches) |
|---|---|
| 19 | 0.49 |
| 20 | 0.08 |
| 21 | 0.00 |
| 22 | 0.00 |
| 23 | 0.79 |
| 24 | 1.20 |
| 25 | 1.53 |

*Data from the U.S. Weather Service, Memphis, Tennessee.

FIGURE 3
PLANT FLOW
T. E. MAXSON WTP
MEMPHIS, TENNESSEE



Return sludge flow rates were also measured with magnetic flowmeters. An average of 15.2 mgd of sludge was returned daily, which was approximately 30 percent of the raw wastewater flow. A total of 0.88 million gallons of sludge was wasted to the aerobic digesters from October 18 through 19. No additional sludge was intentionally wasted during the study.

All WTP flow measurements are recorded by computer. These measurements are averaged and can be readily retrieved on a screen or in tabulated computer printout form at the WTP.

Wastewater Characteristics and Removal Efficiencies--

Removal efficiencies were calculated using averaged data from seven consecutive 24-hour flow proportional composite samples. Turbidity, oil and grease, and phenols were collected on a grab sample basis. Influent oil and grease and phenol results of 606 mg/l and <10 mg/l, respectively, were not included in the calculations since they represented a batch discharge and were based on a single grab sample. Table III presents a chemical description of the influent and effluent wastewater with calculated removal efficiencies.

The average composite influent $BOD_5$ (533 mg/l) and total suspended solids (384 mg/l) concentrations represented a strong waste, indicating the large quantity of industrial wastewaters discharged into the system. The organic wastewater loading (173,400 lbs $BOD_5$/day), based on the average composite $BOD_5$ and the average flow of 39 mgd, was greater than the design loading of 166,000 lbs $BOD_5$/day. The suspended solids loading of 124,900 lbs/day was less than the design loading of 195,000 lbs/day. The average 24-hour $BOD_5$ loading for October 21 through 22 was 232,400 lbs/day

## TABLE III

## WEEKLY AVERAGE WASTEWATER CHARACTERISTICS AND REMOVAL EFFICIENCIES

## T. E. MAXSON WTP, OCTOBER 18-25, 1976

| PARAMETER | INFLUENT (mg/1) | EFFLUENT (mg/1) | REDUCTION (%) |
|---|---|---|---|
| $BOD_5$ | 533 | 165 | 69 |
| COD | 984 | 449 | 54 |
| Total Solids | 884 | 612 | 31 |
| Total Volatile Solids | 428 | 238 | 44 |
| Total Suspended Solids | 384 | 210 | 45 |
| Volatile Suspended Solids | 254 | 143 | 44 |
| TKN-N | 31.9 | 25.2 | 21 |
| $NH_3$-N | 11.8 | 14.2 | — |
| $NO_3$-$NO_2$-N | <0.02 | <0.01 | — |
| Total Phosphorus | 15.5 | 12.8 | 17 |
| Lead | 0.147 | <0.104 | >29 |
| Chromium | <0.065 | <0.053 | — |
| Copper | 0.110 | 0.074 | 33 |
| Cadmium | <0.010 | <0.010 | — |
| Zinc | 0.258 | 0.163 | 37 |
| Oil and Grease | 29(606) | <10 | >65 |
| Turbidity* | — | 36 | — |
| Phenols | 513(<10) | <10 | >98 |

* Result reported in NTU

() Result not used in the removal efficiency calculation or 140 percent of the design loading. The influent organic load is presently exceeding the organic design load at half of the design flow. Two additional interceptors, Presidents Island and Horn Lakes, are planned. When connected, they will grossly overload the WTP.

The NPDES permit issued in June, 1975 limits the average weekly $BOD_5$ and TSS concentration in the effluent to 45 mg/l each(2). During the study, the average weekly $BOD_5$ and TSS effluent concentration was 165 and 210 mg/l, respectively. The average weekly reduction of $BOD_5$, COD, and total suspended solids was 69, 54, and 45 percent, respectively. Table III shows that treatment of the waste was not compatible with secondary treatment standards as required by the NPDES permit.

The ratio of $BOD_5$ to nitrogen and phosphorus was calculated at 100/6/3 by weight. As compared to the recommended ratio of 100/6/1, the raw waste was not considered to be limited in either nitrogen or phosphorus(3).

Analyses for organic compounds were conducted on influent and effluent grab samples which were composited over a seven day period from October 19 through October 25. Eighteen compounds were detected and the results are presented in Table IV. Four compounds (ramrod, chlorodane, prometon, and atrazine) are pesticides. Eight compounds (chloroform, trichloroethylene, tetrachloroethylene, toluene, ethyl benzene, chlorodane, naphthalene, and diethyl phthalate) are on EPA's Consent Decree, "65 Toxic Chemicals List"(4). Chlorodane, chloroform, ramrod, and terpineol isomer were detected in the influent at concentrations of 2.6, 0.18, 0.265, and 0.18 mg/l, respectively. These concentrations were significantly higher than those for the other compounds. Based on the average influent flow of 39 mgd, the loadings for the four compounds were 846, 58.5, 86.2, and 58.5 lbs/day, respectively.

## TABLE IV

## ORGANIC COMPOUNDS DETECTED IN T. E. MAXSON WTP INFLUENT AND EFFLUENT WASTEWATERS OCTOBER 18-25, 1976

| PARAMETER | INFLUENT (mg/1) | EFFLUENT (mg/1) |
|---|---|---|
| Chloroform ** | 0.180 | 0.210 |
| Dimethyldisulfide | 0.012 | 0.038 |
| Trichloroethylene ** | 0.039 | ND * |
| Tetrachloroethylene ** | 0.013 | ND |
| Toluene ** | 0.060 | ND |
| Ethyl Benzene ** | 0.015 | ND |
| Two Isomers of Xylene | 0.026 | ND |
| Ramrod | 0.265 | 0.151 |
| Chlorodane ** | 2.6 | 3.0 |
| Prometon | 0.0029 | ND |
| Atrazine | 0.00097 | ND |
| Indole | 0.077 | 0.002 |
| Naphthalene ** | 0.022 | ND |
| Terpineol Isomer | 0.18 | ND |
| Dimethyl Naphthalene Isomers | 0.030 | ND |
| Methyl Indole | 0.0042 | ND |
| Diethyl Phthalate ** | 0.060 | ND |

* ND = None Detected

** On EPA's Consent Decree, "65 Toxic Chemicals List" (4)

These are only approximate values since they are based on grab samples and average study flows. Significant quantities of chlorodane, chloroform, and ramrod (976, 68.3, and 49.1 lbs/day, respectively) were discharged from the WTP.

On October 21, a distinct influent condition was observed from 8 a.m. to 12 noon. Characteristic of an emulsion, its appearance was milky white and it smelled of oil. An influent grab sample was taken and a series of analyses were conducted. Results are presented in Appendix A as sample O&M #1318. The $BOD_5$ (>1,200 mg/l), COD (2,440 mg/l), and total suspended solids (803 mg/l) concentrations were high, producing an organic overload at the WTP. The oil and grease concentration in this particular sample was 606 mg/l. Information covered in the Industrial Discharge section indicates that Hunt Wesson Foods, Inc. was the most probable contributor to this condition.

During the study, influent pH was monitored continuously. Results are indicated in Figure 4. pH values ranged from 5.0 to 11.2 and were frequently below 6.0. Wastewaters having pH values below 6.0, or greater than 9.0 for extended periods of time are not conducive to optimum treatment in a biological process. Rapid and substantial pH changes observed on October 19, 20, and 23 indicate large volumes of strong alkaline waste discharged into the waste collection system.

Hourly influent samples were collected for COD analysis during three separate 24-hour periods (October 18 through 19, 20 through 21, and 22 through 23). The results are presented in Figure 5 and in Appendix A. These concentrations ranged from 310 mg/l (82,690 lbs/day) to 2,480 mg/l (657,700 lbs/day). Based on the average $COD/BOD_5$ ratio for the study

## FIGURE 4
## CONTINUOUS INFLUENT pH RECORDING
## T. E. MAXSON WTP
## MEMPHIS, TENNESSEE

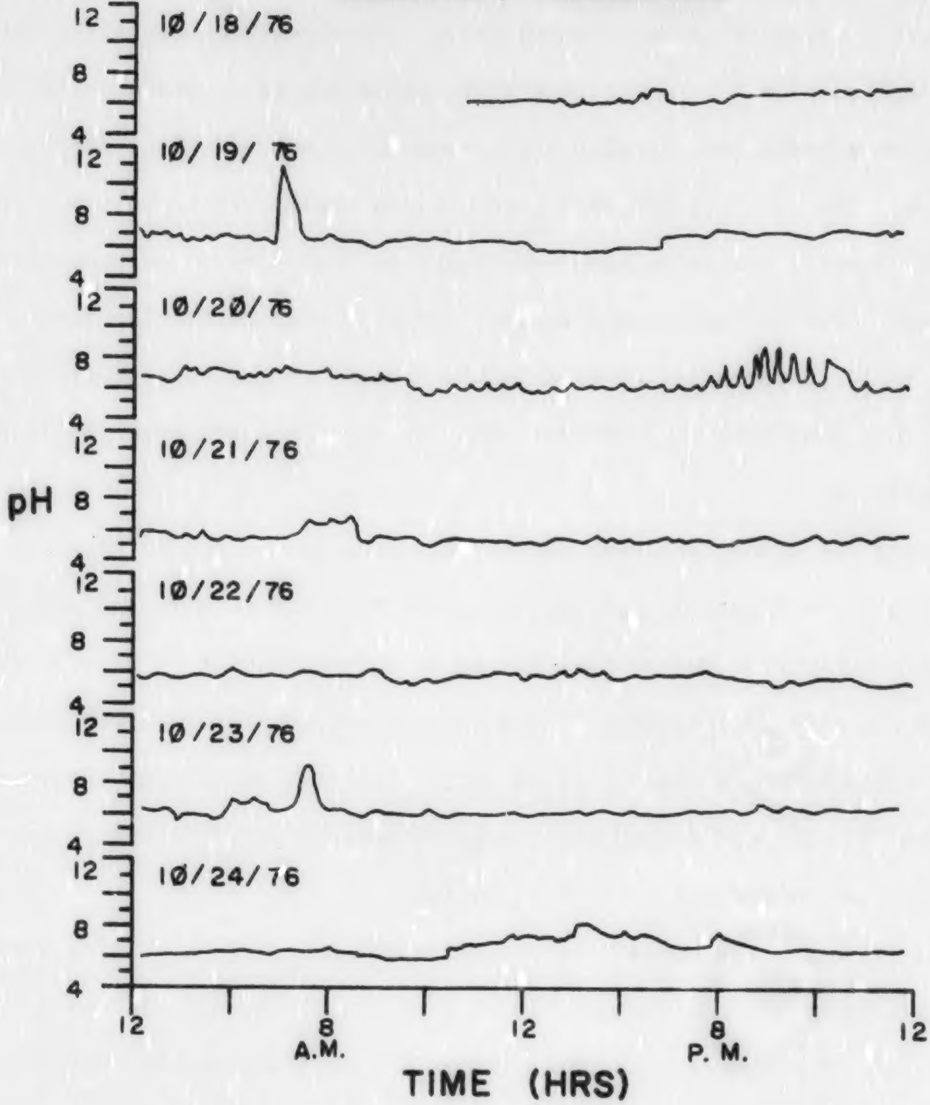
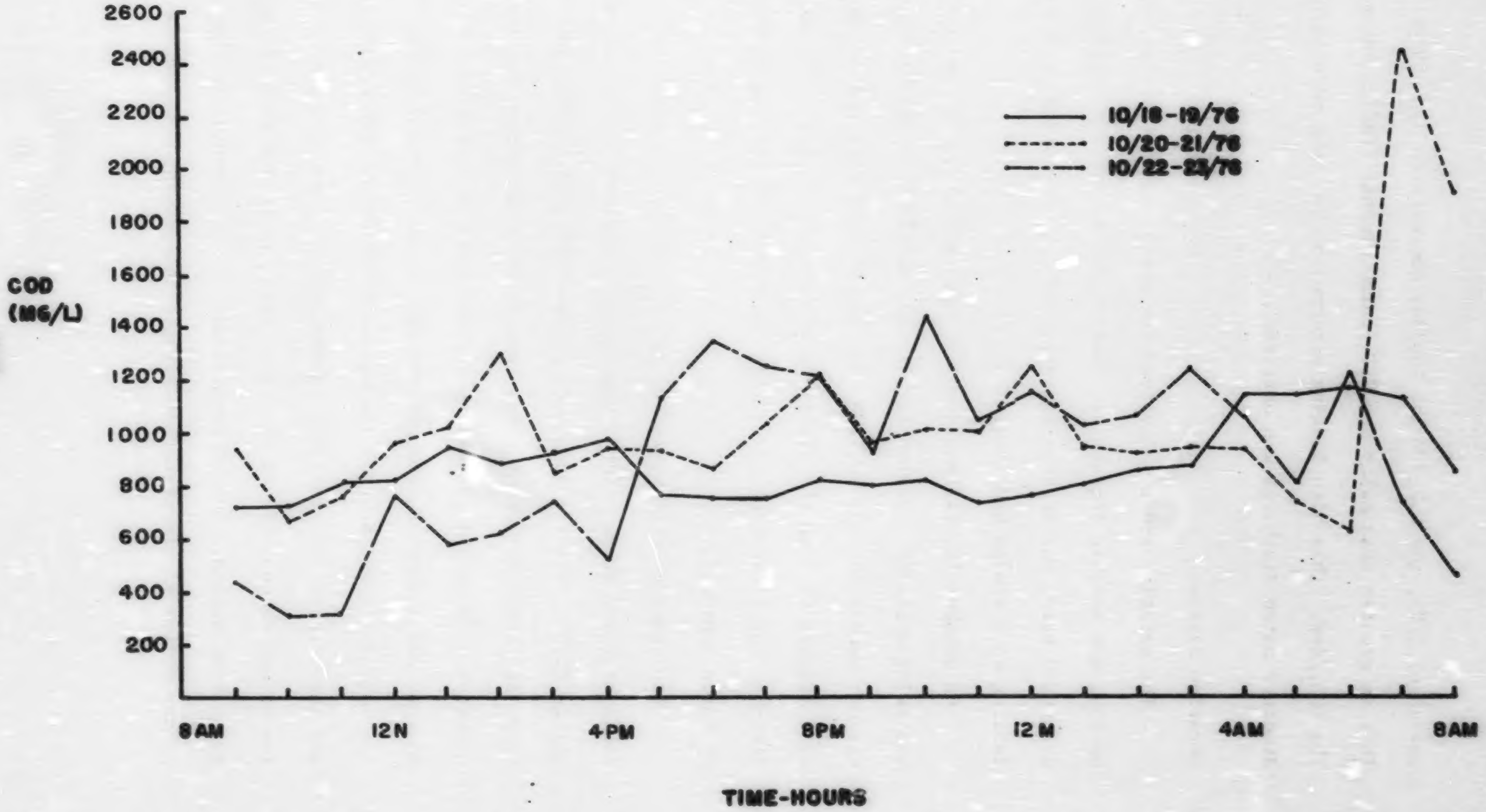


FIGURE 5
INFLUENT COD
T. E. MAXSON WTP
MEMPHIS, TENNESSEE



period of 1.85, the 657,700 lbs COD/day converts to 356,300 lbs $BOD_5$/day. This is greater than twice the WTP design organic loading rate of 166,000 lbs $BOD_5$/day. This high loading occurred on the same morning that the distinct batch discharge was observed.

### Aeration Basins--

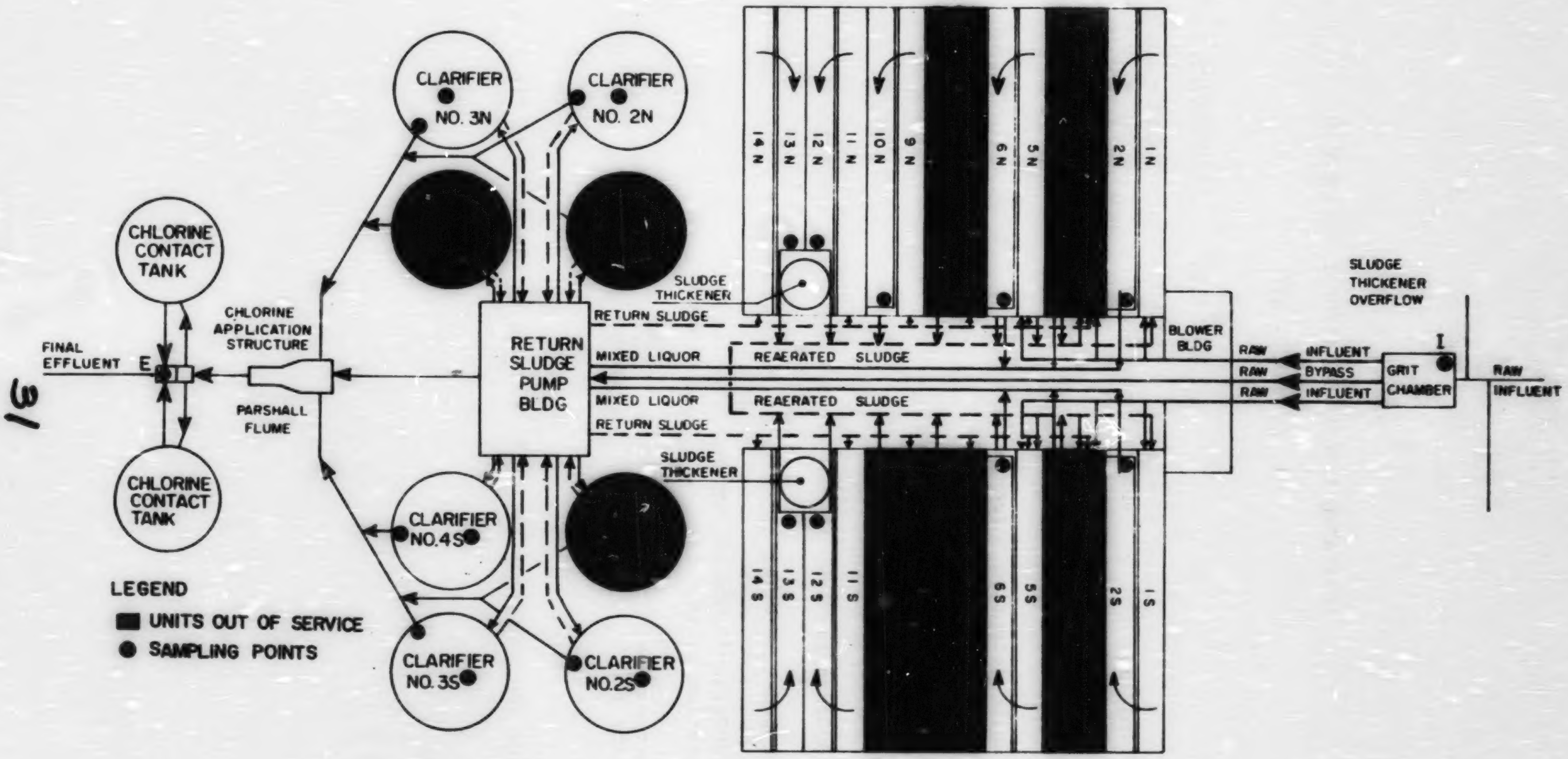
The aeration process involved the use of contact basins, reaeration basins, and aerobic digesters. Contact and reaeration basins will be discussed here, and aerobic digesters will be discussed in the subsection dealing with sludge handling.

On October 18, fifty percent of the available aeration basin capacity was being utilized. Basins 1N, 2N, 1S, and 2S were employed as contact basins; basins 5N, 6N, 9N, 10N, 5S, and 6S were employed as reaeration basins (Figure 6). On the afternoon of October 19, basins 3S and 4S were included for reaeration use. This increased utilization to sixty percent of basin capacity.

Grab samples were collected daily from each contact and reaeration basin effluent area. These samples were analyzed for total suspended solids (TSS), volatile suspended solids (VSS), percent solids by centrifuge, and settleability (contact basins only) as determined by the settlometer. Presented in Table V are various calculated activated sludge operational parameters and recommended design values from the literature.

Dissolved oxygen (DO) was measured throughout the aeration basins and the results are presented in Appendix B. These data show critically low oxygen concentrations in the contact basins and some areas of the reaeration basins. Low DO conditions were detrimental to the microorganisms in the activated sludge and encouraged the growth of filaments. The re-

# FIGURE 6
T. E. MAXSON WTP
MEMPHIS, TENNESSEE



SLUDGE THICKENER OVERFLOW
I
GRIT CHAMBER
RAW INFLUENT
RAW INFLUENT
RAW BYPASS
RAW INFLUENT
BLOWER BLDG
1 N
2 N
5 N
6 N
9 N
10 N
11 N
12 N
13 N
14 N
1 S
2 S
5 S
6 S
11 S
12 S
13 S
14 S
SLUDGE THICKENER
SLUDGE THICKENER
REAERATED SLUDGE
REAERATED SLUDGE
RETURN SLUDGE
MIXED LIQUOR
MIXED LIQUOR
RETURN SLUDGE
RETURN SLUDGE PUMP BLDG
CLARIFIER NO. 3N
CLARIFIER NO. 2N
CLARIFIER NO. 4S
CLARIFIER NO. 3S
CLARIFIER NO. 2S
CHLORINE APPLICATION STRUCTURE
PARSHALL FLUME
CHLORINE CONTACT TANK
CHLORINE CONTACT TANK
FINAL EFFLUENT
E
LEGEND
■ UNITS OUT OF SERVICE
● SAMPLING POINTS

# TABLE V

# ACTIVATED SLUDGE OPERATIONAL PARAMETERS

# T. E. MAXSON WTP

| | | Measured | Recommended (5,6,7) | Design |
|---|---|---|---|---|
| MLSS (mg/l) | (contact) | 2,060 | 1,000 - 3,000 | |
| | (reaeration) | 6,060 | 4,000 - 10,000 | |
| MLVSS (mg/l) | (contact) | 1,500 | | |
| | (reaeration) | 4,560 | | |
| Hydraulic detention time (hrs) | (contact) | 1.15 | 0.5 - 1.5 | 0.86 |
| | (reaeration) | 2.3 * | 3 - 6 | 4.0 |
| Mean Cell Residence Time (days) | | 7.7 | 5 - 15 | |
| Sludge age (days) | | 2.3 | 3.5 - 7.0 | |
| Lbs BOD/day/lb MLVSS (F/M) | | 0.80 | 0.2 - 0.6 | |
| Lbs COD/day/lb MLVSS | | 1.48 | 0.5 - 1.0 | |
| Lbs $BOD_5$/day/1,000 cu. ft. of aeration basin | | 168 * | 60 - 75 | |
| Return sludge rate (% of average plant flow) | | 39 | 25 - 100 | 75 |

*Using the number of basins in service at the start of the study (Figure 5) sult was poor sludge settleability, foul odors, and excessive oxygen uptake at the head of the aeration basins. The regulation of air flow rates to maintain 1.0 to 2.0 mg/l of DO in the basins would alleviate these problems. These DO levels can be reached by a close regulation of the air and waste flow rates into each basin.

During the study, either two or three air compressors (maximum output 42,000 cfm each) were operated. When balanced against the average influent $BOD_5$ loading of 173,400 lbs/day, the air supply was inadequate. Assuming a removal percentage of 85 percent and 1,000 cfm/lb $BOD_5$, the required air supply should be 102,300 cfm for oxidation of the incoming $BOD_5$. This supply does not include air required for the digesters and aerated grit chamber. These figures indicate a minimum of three compressors are required for average flow conditions. A fourth compressor would be required under peak loading conditions. Occasionally, as observed on the morning of October 21, air could not be supplied in sufficient volume to maintain recommended DO concentrations.

The loading parameters calculated in Table V indicate that the system was organically overloaded, particularly since only a portion of the WTP was in service. The number of basins in service was selected to match the hydraulic loading rather than the organic loading. Mean cell residence time (MCRT) and sludge age were at the low end of the recommended range. Due to the large volume of solids lost in the effluent plus the small number of aeration basins in service, there was not enough activated sludge to handle the incoming waste load. Subsequently, the organic loading ($BOD_5$/day/1,000 cu. ft.) exceeded approximately twice its recommended levels.

Although these observations suggest that the problem could be partially solved by placing the other aeration basins into service and operating the third and fourth air compressors, this approach poses some problems. The flow rates were restricted between the reaeration and contact basins, which according to WTP personnel allows a 20 mgd maximum reaerated sludge return. The system was designed to return 60 mgd (75 percent) of design flow. The facility is not capable of attaining designed removal efficiencies with a 25 percent (20 mgd/80 mgd) reaerated sludge flow rate. An analysis of the return sludge piping system, where the problem apparently exists, was beyond the scope of this study. There are a number of possibilities that could cause unanticipated head losses through the system. Some of these possibilities include:

(1) Undersized piping due to design or construction error;

(2) Excessive solids deposition in the rectangular channel, which could reduce the effective cross-sectional area;

(3) Air entrainment, which could also reduce the effective cross-sectional area;

(4) Increased head losses, due to debris trapped on the motorized butterfly valves;

(5) Unanticipated influent and effluent head losses into and out of the rectangular channel;

(6) Physical obstructions left during construction; and

(7) Excessively high solids which could contribute to higher head loss.

Many of these possibilities have been investigated unsuccessfully. Currently, a trial test is being made by WTP personnel which involves the removal of the butterfly valves. Initial indications show that the valves may be significantly reducing the flow. Similar problems have been observed in other plants (particularly in those without primary clarifiers) where butterfly valves have created problems by trapping debris.

The activity of sludge is a valuable indicator of effluent quality. Two methods of determining sludge activity are oxygen uptake rates and microscopic examinations. The oxygen uptake rate or load ratio is the measure of oxygen depletion before and after the introduction of raw waste.

$$\text{Load ratio} = \frac{\text{DO/min fed Sludge}}{\text{DO/min Unfed Sludge}}$$

The oxygen uptake procedure is presented in Appendix C. Calculated load ratios are listed in Table VI.

These ratios indicate a very active sludge and an acceptable raw waste which does not inhibit the biological treatment process. Load ratios of four or more are generally associated with high rate wastewater treatment plants. The table does not note the rapid depletion of oxygen from the fed samples. On both days of testing, 6.2 to 7.9 mg/l of oxygen was depleted within two minutes. This rapid oxygen uptake shows possible DO stress in the contact basins.

Before and during the study, a microscopic examination of the activated sludge mixed liquor solids showed a vast growth of filamentous

## TABLE VI

## OXYGEN UPTAKE RATES

## T. E. MAXSON WTP

## OCTOBER 19-20, 1976

| | | | | AVERAGE $O_2$ - UPTAKE | |
|---|---|---|---|---|---|
| | | RS | URS * | FRS ** | |
| **Date** | **Time** | **%** | **mg/l/min** | **mg/l/min** | **FRS/URS** |
| 10/19/76 | 1:45 | 40 | 0.70 | 3.00 | 4.28 |
| 10/20/76 | 10:30 | 40 | 0.73 | 3.02 | 4.14 |

* URS - Unfed return sludge using clarifier effluent

** FRS - Fed return sludge using raw influent organisms. Photographs made by the WTP microbiologist showed that the filaments included sphaerotilus and actinomycete organisms. Filamentous growths settle slowly, resulting in large carryover from the final clarifier.

Protozoan indicators were present. Stalk ciliates, along with rotifer, were also in abundance. This abundance of organisms, coupled with the normal unfed DO uptake rates, definitely indicate a stable sludge which is capable of producing good quality effluent. Quality can be improved by removing conditions causing excessive filamentous growth. Increased DO concentrations throughout the total system would aid in eliminating such conditions.

### Clarifiers--

The eight clarifiers have a center feed rim take-off flow configuration, with the sludge lifted by pick-up tubes to the center well. The effluent launder was placed seven feet from the wall of the clarifier. A subcontractor was stripping and repainting all of the metal work in each clarifier. This required drainage of the clarifiers, but presented no operational problems, since the WTP was only receiving approximately 50 percent of the hydraulic design loading. A new grout bottom had just been completed in one clarifier. This was necessary to level the rough bottom and facilitate smooth operation of the sludge removal equipment.

The depth of sludge blanket (DOB) below the water surface varied from zero to full depth of the clarifier. The measurements revealed a significant imbalance of flow into the five clarifiers in operation, as well as a sludge withdrawal from these clarifiers. This imbalance caused a buildup of sludge and produced a number of operational problems. The imbalance also indicated problems with the accuracy of the magnetic flowmeters used to regulate flow into the respective clarifiers. Even though the central control panel indicated balanced flows, significant differences in flow rates over the clarifier weirs were observed. The sludge became rapidly septic, killing many of the microorganisms. This resulted in a large volume of solids being lost over the weir.

The following visual observations were made on October 20:

(1) Clarifier 2S - The outside weir of the effluent launder was lower than the inside weir; the weir was about one inch out of level, and heavy solids losses occurred at 2 p.m.

(2) Clarifier 3S - No solids were being lost and the weir level was acceptable.

(3) Clarifier 4S - The effluent launder dipped to the outside; more flow was noticed over the outside weir, and it was about 3/4 inch out of level.

(4) Clarifier 2N - The weirs were about 3/4 inch out of level in two places; less flow than in the south clarifiers was noticed, even though the magnetic flowmeters indicated the same flow rates.

(5) Clarifier 3N - The weirs were about two inches out of level; this clarifier was performing very poorly with heavy solids losses at 2:35 p.m., and less flow than in the south clarifiers was also noticed.

The clarifier overflow rates were drastically different. Appearance of these differences occurred at a time when the magnetic flowmeters indicated that the overflow and underflow rates from the five clarifiers were essentially balanced. These observations, along with DOB measurements, indicate that proper equipment adjustment and additional operational controls are needed. Elimination of these two problems would significantly improve clarifier operations and effluent quality.

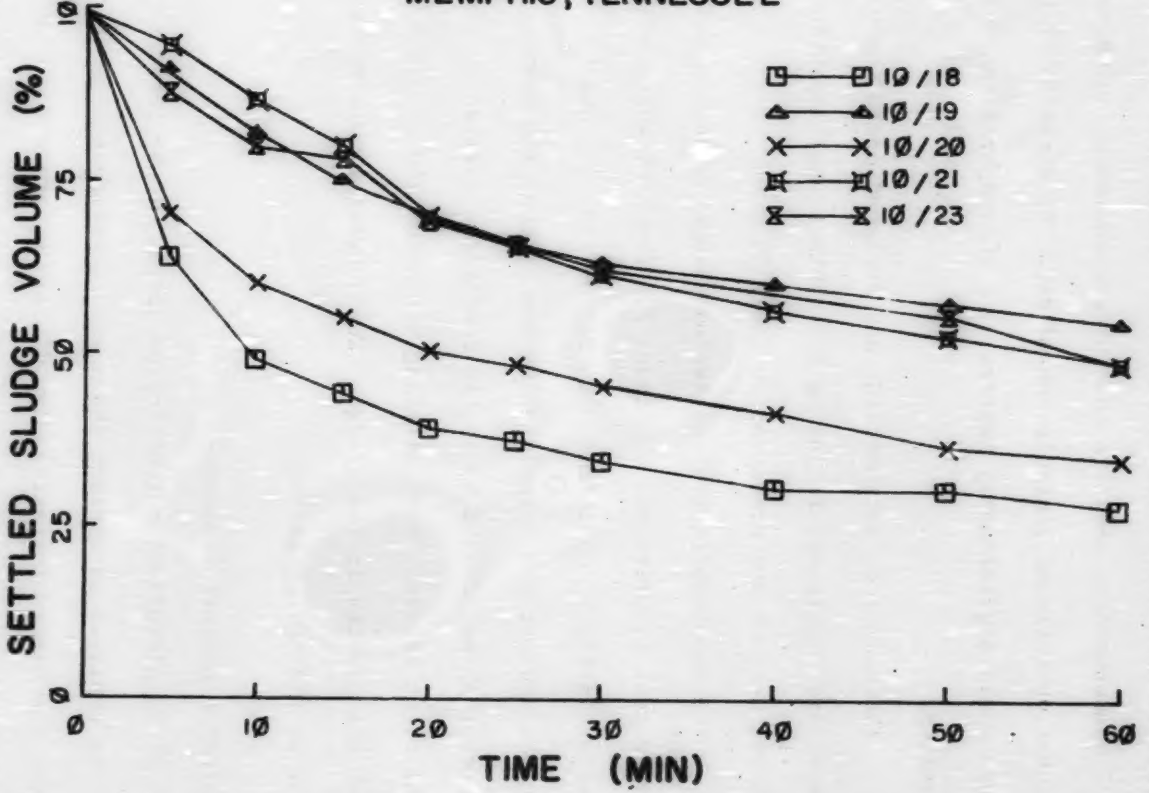
The measured, recommended, and designed operating parameters for secondary clarifiers following the contact stabilization activated sludge process are presented in Table VII.

The settleability of activated sludge as determined by the settlometer test is presented in Figure 7. These curves demonstrated acceptable clarifier conditions. On October 19, 21, and 23, however, the curves indicated a deteriorating condition. The poor settling curve for October 19 was caused by septic conditions created by a power outage the night before. Poor settling was primarily caused by excessive filamentous growths in the sludge. These growths were probably encouraged by low DO and pH conditions.

Chlorine Contact Chambers--

The disinfection facility consisted of two parallel circular clarifiers employed as contact chambers. Chlorine gas was automatically fed into the wastewater stream immediately upstream from the Parshall flume and is supplied from railroad tank cars.

FIGURE 7
DAILY AVERAGE OF SETTLOMETER RESULTS
T E MAXSON WTP
MEMPHIS, TENNESSEE



## TABLE VII

## SECONDARY CLARIFIER OPERATIONAL PARAMETERS

## T. E. MAXSON WTP

| | Measured | Recommended (7,8,9) | Design |
|---|---|---|---|
| Hydraulic loading (gpd/sq. ft.) | 545 | 400 - 800 | 700 |
| Solids loading (lbs/day/sq.ft.) | 19.6 | 20 - 30 | |
| Hydraulic detention (hrs) | 3.55 | 2 - 2.5 | 3.85 |
| Weir overflow rate (gpd/lin. ft.) | 10,300 | 15,000 | 13,500 |

Wastewater treatment plant laboratory records indicate that during the six month period prior to the study, average chlorine dosage rates ranged from 1,800 to 2,700 lbs/day. However, the chlorine supply was depleted on October 14, 1976 and the effluent was not disinfected during the study.

Because of heavy solids losses from the final clarifier, the chlorine contact chamber contained excessive solids. Solids were observed throughout the chambers, and there was one foot of solids measured on the bottom. Detention time in the chambers was calculated at 1.1 hours, as compared to a design of 0.5 hours.

### Sludge Handling--

Sludge digestion and holding facilities consisted of four aerobic digesters, two gravity sludge thickeners and a 13-acre sludge holding lagoon. These facilities are inadequate to properly handle the large volume of sludge generated at this facility. Except for air supply, the capacity of the four aerobic digesters is probably sufficient, if the waste sludge is thickened to at least three to four percent solids. Effective use of the gravity sludge thickeners is necessary to maximize the digester efficiency. The suspended solids concentration in the digesters during the study was 0.4 to 0.7 percent, which indicated poor utilization of the thickeners.

Sufficient air capacity was not available to operate both the activated sludge system and the digesters. Under current loading conditions, all five blowers would be required to be in service.

The sludge lagoon has a volume of approximately 70 million gallons and a surface area of 13 acres. The discharge of undigested sludge to such a facility produces foul odors, which creates severe nuisance problems. The capacity of the lagoon is not sufficient to provide sludge storage for an extended period of time.

Laboratory--

The laboratory was clean, well equipped, and adequate in size. It was staffed by a chemist, an assistant chemist, and two chemical analysts who conduct all analyses for the WTP, plus routine sampling and analyses for four other treatment facilities. These chemical analyses include $BOD_5$, settleable solids, TSS, VSS, DO, pH, temperature, and fecal coliform for all five facilities, plus oil and grease, chromium, copper, lead, mercury, nickel, zinc, cyanide, phenols, and $NH_3$-N for the T.E. Maxson WTP. At present, the laboratory appears to be understaffed for the required workload.

The WTP control testing program included aeration basin TSS, VSS, and DO (at one depth). The following tests are not currently performed and should be included in the testing program: (1) settlometer; (2) clarifier sludge blanket depth; (3) aeration basin DO at various depths, and (4) percent solids by centrifuge. The centrifuge is not absolutely essential, but permits a rapid comparison of TSS concentrations between the various basins. Trend charts should be established and maintained. Useful parameters for plotting include MLSS, sludge settleability, significant influent and effluent waste characteristics, flow (WTP, return sludge, waste sludge), depth of clarifier sludge blanket, MCRT, and F/M ratios. Experience will dictate which of these parameters are necessary for successful WTP operations. These suggested parameters serve only as a guide, and are intended to establish trends so that gradual changes in WTP conditions can be detected prior to deterioration in effluent quality. It is advisable that WTP changes be made one at a time, and maintained for approximately two weeks to allow the WTP to reach equilibrium.

## TOXICITY STUDY

### Introduction

During October 15 through 22, 1976, toxicity studies were conducted on influent and effluent wastewaters of the T.E. Maxson WTP. These studies were carried out in conjunction and simultaneously with the operation and maintenance investigations discussed in the previous section. Bioassay techniques approved by EPA were utilized. The results are presented in this section of the report.

### T.E. Maxson WTP Operations

(See T.E. Maxson Wastewater Treatment Plant section of this report).

### Bioassay Methods and Test Organisms

"Methods for Acute Toxicity Test for Fish, Macroinvertebrates, and Amphibians" was used as a guide in conducting the toxicity study (12). Results are reported as an LC50 value. This value is defined as the lethal concentration of waste at which 50 percent of the test organisms die.

Water fleas (Daphnia magna) were approximately 96 hours old when used in 48-hour acute static bioassays. Bluegill sunfish (Lepomis macrochirus), referred to as sunfish, approximately 7 months old, 47 mm in length and 1.6 grams in weight, were used in flow-through and static bioassays. The cycling time of the flow-through diluter system was 10 minutes. This time provided a complete volume change in the test aquaria every two hours and twenty minutes.

In addition to the on-site flow-through bioassay, an algal bioassay study was conducted at the Athens laboratory. Selenastrum capricornutum were used in this test. Guidelines developed by EPA, "Algal Assay Procedure: Bottle Test," were followed during this procedure (13).

## Sampling

Except from the period 8:00 p.m. until 8:00 a.m., approximately 25-50 gallons of influent and effluent wastewater were collected at four-hour intervals. The influent sample was pumped from the grit chamber through a #30 sieve to remove large solids which could clog the flow-through diluter. Effluent wastewater was collected from the final clarifier before chlorination. The waste samples were contained in 55 gallon drums, located adjacent to the mobile bioassay trailer, and were pumped continually through the diluter systems.

Dissolved oxygen, temperature, pH, and other parameters were recorded. Grab samples for chemical analyses were taken periodically from the influent, effluent, and dilution water during the flow-through bioassays, and at the start of static bioassays. These samples were in addition to those collected during the operation and maintenance phase of the study.

Influent and effluent wastewater samples were collected on October 22, 1976, refrigerated, and returned to the Athens laboratory for algal assays. The dilution water used was collected from wells located at Davis Station Water Plant on Shelby Drive in Memphis.

## Results

The LC50 value in this study is reported as percent by volume of the WTP's influent and effluent wastewater, which was diluted by well water. A total of six toxicity studies yielded the following results:

| | | | LC50 |
|---|---|---|---|
| **INFLUENT** | Test 1 - Sunfish, flow-through | (24 hr.) | <5.6% |
| | Test 2 - Sunfish, flow-through | (72 hr.) | >20% |
| | Test 3 - Waterflea, static | (48 hr.) | 12% |
| | Test 4 - Sunfish, static | (24 hr.) | 37.5% |
| **EFFLUENT** | Test 5 - Fish, flow-through | (96 hr.) | 82.5% |
| | Test 6 - Waterflea, static | (48 hr.) | 38.7% |

Test 1 (Sunfish Test) was begun on October 18, 1976. During the afternoon, a slug of toxic wastewater caused mortality to occur through the lowest (5.6 percent) wastewater volume (Table VIII).

Test 2 (Sunfish Test) was begun on October 19, 1976 with the diluter system being recalibrated for a lower wastewater percent volume (1.1 to 20.0 percent) to compensate for expected slug discharges. During the 72-hour exposure period, however, significant mortality did not occur in the highest percent volume (Table IX). The sampling technique allowed the fish short exposure to grab samples of influent wastewater. The fish were in stress quite often, but would revive when exposed to a newly collected wastewater sample. This indicates the addition of a less toxic waste sample. Mortality would probably have occurred if the fish remained exposed to the more toxic waste for a longer period of time. At the end of 72 hours exposure, the fish in 20.0, 11.2, and 6.4 percent of the diluted wastewater were covered with a visible bacterial growth.

Results of Tests 3-6 are listed in Tables X-XIII from which the LC50 values were derived.

The effluent and influent samples collected for algal bioassay were not toxic to algae. In fact, the wastewater stimulated increased algal growth. There was no significant difference in the increased growth between the influent or effluent.

Chemical analyses of influent and effluent wastewater samples revealed a very complex mixture of chemicals (Table XIV and XV). A single chemical, acting alone or in combination, could have been causing the toxic conditions. Influent chemical concentrations were generally reduced during passage through the wastewater treatment plant with a concomitant reduction in toxicity.

Organic compounds combine with chlorine to form various organic complexes which may be, in some cases, more highly toxic than the original organic compound. At the time of study, the WTP was not chlorinating the effluent, therefore, an additional toxicity study should be conducted under normal disinfection processes to assess the potential production of toxic organochlorine compounds.

It should be noted some of the chemicals on the "List of 65 Toxic Compounds", contained in the EPA consent decree (4), present in the WTP influent were still present in detectable concentrations in the effluent (Table XIV).

## TABLE VIII

### TEST 1 - INFLUENT
### 24-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
### T.E. MAXSON WTP
### OCTOBER 18-19, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISM | | DISSOLVED OXYGEN MG/L | | PH | | TOTAL ALKALINITY (MG/L AS CACO3) | | TOTAL HARDNESS (MG/L AS CACO3) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0-HR | 24-HR | 0-HR | 24-HR | 0-HR | 24-HR | 0-HR | 24-HR | 0-HR | 24-HR |
| 0.0 | 10 | 10 | 11.3 | 9.9 | 6.5 | 7.0 | 102 | 102 | 90 | 88 |
| 0.0 | 10 | 10 | 11.3 | 10.1 | | | | | | |
| 5.6 | 10 | 0 | 11.4 | | 6.7 | | 98 | | 88 | |
| 5.6 | 10 | 0 | 11.2 | 8.8 | | | | | | |
| 10.0 | 10 | 10* | 9.3 | 6.2 | | | | | | |
| 10.0 | 10 | 10* | 9.6 | | | | | | | |
| 18.0 | 10 | 10* | 7.6 | 8.7 | | | | | | |
| 18.0 | 10 | 10* | 7.9 | | | | | | | |
| 32.0 | 10 | 0 | 5.7 | | | | | | | |
| 32.0 | 10 | 0 | 6.2 | | | | | | | |
| 56.0 | 10 | 0 | 9.8 | | | | | | | |
| 56.0 | 10 | 0 | 9.3 | | | | | | | |
| 100.0 | 10 | 0 | 6.4 | | 6.8 | | | 137 | 74 | |
| 100.0 | 10 | 0 | 4.3 | | | | | | | |

* DUE TO A MALFUNCTION IN THE 10 AND 18 PERCENT DILUTIONS, WASTE WATER WAS PREVENTED FROM ENTERING THESE TEST CHAMBERS AND ENABLED THE SUNFISH TO SURVIVE.

## TABLE IX

### TEST 2 - INFLUENT
### 72-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
### T.E. MAXSON WTP
### OCTOBER 19-22, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISMS 0-HR | 24-HR | 48-HR | 72-HR | DISSOLVED OXYGEN MG/L 0-HR | 24-HR | 48-HR | 72-HR | PH 0-HR | 24-HR | 48-HR | 72-HR | TOTAL ALKALINITY (MG/L AS CACO3) 0-HR | 24-HR | 48-HR | 72-HR | TOTAL HARDNESS (MG/L AS CACO3) 0-HR | 24-HR | 48-HR | 72-HR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 10 | 10 | 10 | 10 | 10.6 | 9.3 | 9.8 | 10.6 | 7.0 | 6.9 | 6.7 | 6.8 | 102 | 102 | 101 | 103 | 88 | 86 | 88 | 88 |
| 0.0 | 10 | 10 | 10 | 10 | 10.8 | 9.5 | 9.9 | 10.6 | | | | | | | | | | | | |
| 1.1 | 10 | 10 | 10 | 10 | 10.6 | 8.8 | 8.4 | 9.4 | | 7.0 | 6.7 | 6.8 | | 101 | 101 | 100 | | 84 | 84 | 90 |
| 1.1 | 10 | 10 | 10 | 10 | 10.6 | 8.8 | 8.8 | 9.5 | | | | | | | | | | | | |
| 2.0 | 10 | 10 | 10 | 10 | 10.4 | 7.5 | 7.6 | 8.7 | | | | | | | | | | | | |
| 2.0 | 10 | 10 | 10 | 10 | 10.4 | 7.1 | 7.8 | 8.6 | | | | | | | | | | | | |
| 3.6 | 10 | 10 | 10 | 10 | 10.4 | 7.0 | 6.5 | 7.9 | | | | | | | | | | | | |
| 3.6 | 10 | 10 | 10 | 10 | 10.4 | 7.0 | 6.2 | 7.9 | | | | | | | | | | | | |
| 6.4 | 10 | 10 | 10 | 10 | 10.4* | 8.3 | 6.6 | 7.7 | | | | | | | | | | | | |
| 6.4 | 10 | 10 | 10 | 10 | 10.4* | 8.3 | 7.2 | 8.2 | | | | | | | | | | | | |
| 11.2 | 10 | 10 | 10 | 10 | 9.6* | 7.5 | 5.4 | 7.7 | | | | | | | | | | | | |
| 11.2 | 10 | 10 | 10 | 10 | 9.6* | 8.0 | 5.2 | 7.8 | | | | | | | | | | | | |
| 20.0 | 10 | 10 | 10 | 10 | 9.8* | 7.9 | 4.6 | 8.4 | | 6.9 | 6.7 | 6.7 | | 102 | 107 | | | 84 | 82 | 88 |
| 20.0 | 10 | 10 | 10 | 9 | 9.4* | 8.8 | 6.6 | 8.4 | | | | | | | | | | | | |

* AERATION ADDED

## TABLE X

### TEST 3 - INFLUENT
### 48-HOUR ACUTE STATIC TOXICITY STUDY (WATER FLEAS)
### T.E. MAXSON WTP
### OCTOBER 20-22, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISM 0-HR | 24-HR | 48-HR | DISSOLVED OXYGEN MG/L 0-HR | 48-HR | PH 0-HR | TOTAL ALKALINITY (MG/L AS CACO3) 0-HR | TOTAL HARDNESS (MG/L AS CACO3) 0-HR |
|---|---|---|---|---|---|---|---|---|
| 0 | 20 | 20 | 20 | 9.3 | 10.1 | 6.9 | 102 | 86 |
| 0 | 20 | 20 | 20 | | | | | |
| 1.1 | 20 | 20 | 20 | 8.8 | 10.0 | 7.0 | 101 | 84 |
| 1.1 | 20 | 20 | 20 | | | | | |
| 2.0 | 20 | 20 | 20 | 7.5 | 9.7 | | | |
| 2.0 | 20 | 20 | 20 | | | | | |
| 3.6 | 20 | 20 | 20 | 7.0 | 9.3 | | | |
| 3.6 | 20 | 20 | 20 | | | | | |
| 6.4 | 20 | 20 | 20 | 8.3 | 8.0 | | | |
| 6.4 | 20 | 20 | 20 | | | | | |
| 11.2 | 20 | 13 | 12 | 7.5 | 7.6 | | | |
| 11.2 | 20 | 11 | 10 | | | | | |
| 20.0 | 20 | 0 | 0 | 7.9 | | 6.9 | 102 | 84 |
| 20.0 | 20 | 1 | 1 | 8.8 | 6.5 | | | |

## TABLE XI

### TEST 4 - INFLUENT
### 24-HUUR ACUTE STATIC TOXICITY STUDY (SUNFISH)
### T.E. MAXSON WTP
### OCTOBER 21-22, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISMS 0-HR | NUMBER OF LIVE ORGANISMS 24-HR | DISSOLVED OXYGEN MG/L * 0-HR | DISSOLVED OXYGEN MG/L * 24-HR | PH 0-HR | TOTAL ALKALINITY (MG/L AS CACO3) 0-HR | TOTAL HARDNESS (MG/L AS CACO3) 0-HR |
|---|---|---|---|---|---|---|---|
| 0 | 10 | 10 | 8.9 | | 6.7 | 101 | 90 |
| 5.6 | 10 | 10 | 7.8 | | | | |
| 10.0 | 10 | 10 | 7.5 | | | | |
| 18.0 | 10 | 10 | 5.8 | | | | |
| 32.0 | 10 | 7 | 5.9 | 8.2 | | | |
| 56.0 | 10 | 0 | 5.8 | 6.6 | | | |
| 100.0 | | | | | 6.3 | 133 | 92 |

* ALL CONCENTRATIONS AEREATED.

## TABLE XII

TEST 5 - EFFLUENT
96-HOUR ACUTE FLOW-THROUGH TOXICITY STUDY (SUNFISH)
T.E. MAXSON WTP
OCTOBER 18-22, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISMS | | | | | DISSOLVED OXYGEN MG/L | | | | | PH | | | | | TOTAL ALKALINITY (MG/L AS CACO3) | | | | | TOTAL HARDNESS (MG/L AS CACO3) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0-HR | 24-HR | 48-HR | 72-HR | 96-HR | 0-HR | 24-HR | 48-HR | 72-HR | 96-HR | 0-HR | 24-HR | 48-HR | 72-HR | 96-HR | 0-HR | 24-HR | 48-HR | 72-HR | 96-HR | 0-HR | 24-HR | 48-HR | 72-HR | 96-HR |
| 0.0 | 10 | 10 | 10 | 10 | 10 | 10.8 | 9.9 | 9.2 | 9.8 | 10.6 | 6.5 | 7.0 | 6.9 | 6.7 | 6.8 | 102 | 102 | 102 | 101 | 103 | 90 | 88 | 86 | 88 | 88 |
| 0.0 | 10 | 10 | 10 | 10 | 10 | 10.8 | 10.1 | 9.3 | 9.9 | 10.6 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 5.6 | 10 | 10 | 10 | 10 | 10 | 10.8 | 9.7 | 8.6 | 9.8 | 10.2 | 6.2 | 6.6 | 6.4 | 6.3 | 6.2 | 98 | 99 | 97 | --- | 98 | 90 | 86 | 86 | 88 | 90 |
| 5.6 | 10 | 10 | 10 | 10 | 10 | 10.7 | 9.8 | 8.9 | 9.5 | 10.2 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 10.0 | 10 | 10 | 10 | 10 | 10 | 10.3 | 9.2 | 8.3 | 9.3 | 9.8 | 6.5 | --- | --- | --- | --- | 102 | --- | --- | --- | --- | 90 | -- | -- | -- | -- |
| 10.0 | 10 | 10 | 10 | 10 | 10 | 10.2 | 9.0 | 8.3 | 9.1 | 10.0 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 18.0 | 10 | 10 | 10 | 10 | 10 | 9.4 | 7.6 | 6.8 | 8.3 | 9.2 | 6.7 | --- | --- | --- | --- | 105 | --- | --- | --- | --- | 84 | -- | -- | -- | -- |
| 18.0 | 10 | 10 | 10 | 10 | 10 | 9.5 | 7.5 | 7.0 | 8.2 | 9.6 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 32.0 | 10 | 10 | 10 | 10 | 10 | 8.6 | 5.7 | 9.3 | 8.7 | 8.3 | 6.7 | --- | 7.1 | 6.8 | --- | 114 | --- | 114 | 112 | --- | 86 | -- | 84 | 84 | -- |
| 32.0 | 10 | 10 | 10 | 10 | 10 | 8.5 | 5.2 | 9.1 | 8.5 | 8.6 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 56.0 | 10 | 10 | 10 | 10 | 10 | 8.8 | 6.9* | 8.8 | 8.3 | 9.6 | 7.0 | --- | 7.3 | --- | --- | 126 | --- | 132 | --- | --- | 84 | -- | -- | -- | -- |
| 56.0 | 10 | 10 | 10 | 10 | 10 | 8.8 | 6.0* | 9.2 | 8.5 | 9.8 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |
| 100.0 | 10 | 10 | 10 | 5 | 4 | 5.6 | 5.1* | 8.9 | 7.3 | 8.2 | 7.1 | 7.6 | 7.3 | 7.2 | 7.5 | 156 | 165 | 185 | 160 | 175 | 84 | 84 | 84 | 74 | 88 |
| 100.0 | 10 | 10 | 10 | 1 | 1 | 6.9 | 2.5* | 9.3 | 7.9 | 8.8 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | -- | -- | -- | -- | -- |

* AERATION ADDED

## TABLE XIII

### TEST 6 - EFFLUENT
### 48-HOUR ACUTE STATIC TOXICITY STUDY (WATER FLEAS)
### T.E. MAXSON WTP
### OCTOBER 19-21, 1976

| % WASTE VOLUME | NUMBER OF LIVE ORGANISMS | | | DISSOLVED OXYGEN MG/L | | | PH | TOTAL ALKALINITY (MG/L AS CACO3) | TOTAL HARDNESS (MG-L AS CACO3) |
|---|---|---|---|---|---|---|---|---|---|
| | 0-HR | 24-HR | 48-HR | 0-HR | 24-HR | 48-HR | 0-HR | 0-HR | 0-HR |
| 0.0 | 20 | 20 | 20 | 9.9 | --- | --- | 7.0 | 102 | 88 |
| 5.6 | 20 | 20 | 20 | 9.7 | --- | --- | --- | 99 | 86 |
| 10.0 | 20 | 20 | 20 | 9.2 | --- | --- | --- | --- | -- |
| 18.0 | 20 | 20 | 20 | 7.6 | --- | --- | --- | --- | -- |
| 32.0 | 20 | 19 | 15 | 5.7 | --- | --- | --- | --- | -- |
| 56.0 | 20 | 7 | 0 | 6.9 | --- | 6.6 | --- | --- | -- |
| 100.0 | 20 | 0 | 0 | 5.1 | 3.8 | --- | 7.6 | 165 | 84 |

TABLE XIV

ORGANIC COMPOUNDS DETECTED (MG/L)
TOXICITY STUDIES
T.E. MAXSON WTP
OCTOBER 15-22, 1976

| SAMPLE<br>DATE<br>TIME | TEST III INFLUENT<br>10/20<br>1115 | TEST II EFFLUENT<br>10/20<br>1035 | DILUTION WATER<br>10/20<br>1040 | TEST IV INFLUENT<br>10/21<br>1045 | INFLUENT* (UNFILTERED)<br>10/22<br>0820 | INFLUENT (FILTERED)<br>10-22<br>0825 | EFFLUENT* (UNFILTERED)<br>10/22<br>0930 | EFFLUENT (FILTERED)<br>10/22<br>0930 |
|---|---|---|---|---|---|---|---|---|
| ORGANIC | | | | | | | | |
| TOC | 180 | 57 | 6 | 250 | 210 | -- | 37 | -- |
| RAMROD 5/ | 2.80 | 1.60 | 0.0007 | 0.120 | 0.014 | 0.014 | 0.050 | 0.076 |
| CHLORDANE 6/** | 0.073 | 0.0023 | 0.0001 | 0.0026 | 0.0031 | 0.0024 | 0.0008 | 0.0032 |
| PROMETON 7/ | 0.0104 | 0.011 | ND | 0.0026 | ND | ND | ND | ND |
| ATRAZINE 8/ | 0.0013 | ND | ND | ND | ND | ND | ND | ND |
| BUTYL BENZYL PHTHALATE 9/17/** | ND | ND | ND | ND | ND | ND | 0.10 | 0.097 |
| NAPHTHALENE 1/** | 0.0042 | 0.003 | ND | 0.006 | 0.018 | 0.035 | ND | ND |
| ISOMERS OF TERPINEOL 1/ | 0.055 | 0.064 | ND | 0.059 | 0.087 | 0.087 | ND | ND |
| ISOMERS OF DIMETHYL NAPHTHALENE 1/ | 0.0044 | 0.0014 | ND | 0.0063 | 0.0044 | 0.018 | ND | ND |
| ISOMERS OF METHYL NAPHTHALENE 1/ | 0.049 | ND | ND | 0.035 | 0.0047 | 0.002 | ND | ND |
| INDOLE 1/ | 0.031 | 0.0096 | ND | ND | 0.19 | 0.16 | ND | ND |
| DIETHYL PHTHALATE 1/** | ND | ND | ND | ND | 0.11 | ND | ND | ND |
| METHYLENE CHLORIDE 3/** | 0.032 | ND | -- | ND | ND | -- | ND | -- |
| DIMETHYL SULFIDE 3/17/ | 0.064 | ND | -- | 0.097 | 0.031 | -- | ND | -- |
| ISOMERS OF DICHLOROETHYLENE 3/** | 0.012 | ND | -- | 0.015 | ND | -- | ND | -- |
| ISOMERS OF TRICHLOROETHANE 3/** | 0.038 | ND | -- | ND | ND | -- | ND | -- |
| DIMETHYLDISULFIDE 4/ | 0.260 | ND | -- | 0.070 | 0.0087 | -- | ND | -- |
| TRICHLOROETHYLENE 4/** | 0.340 | 0.019 | -- | 0.210 | 0.033 | -- | 0.0058 | -- |
| TETRACHLOROETHYLENE 4/** | 0.024 | 0.0036 | -- | 0.015 | 0.011 | -- | ND | -- |
| TOLUENE 3/** | 0.870 | 0.0091 | -- | 0.980 | 0.940 | -- | ND | -- |
| ETHYL BENZENE 3/** | 0.052 | ND | -- | 0.026 | 0.0075 | -- | ND | -- |
| 2 ISOMERS OF XYLENE | 0.083 | 0.0054 | -- | 0.075 | 0.022 | -- | -- | -- |
| PHENOL + ISOMER OF CRESOL 1/ | 0.122 | 0.025 | ND | 0.028 | 0.280 | 0.084 | ND | ND |
| PHENYL ETHANOL 1/17/ | 0.044 | 0.007 | ND | 0.010 | 0.100 | 0.040 | ND | ND |
| ISOMERS OF CRESOL 1/ | 0.110 | 0.029 | ND | 0.015 | 0.190 | 0.013 | ND | ND |
| ISOMERS OF ETHYL PHENOL 1/ | 0.018 | 0.015 | ND | 0.013 | 0.022 | 0.085 | ND | ND |

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1/ ESTIMATED CONCENTRATIONS, FLAME IONIZATION DETECTOR

3/ ESTIMATED CONCENTRATIONS, MASS SPECTROMETER

4/ TRUE VALUE, MASS SPECTROMETER

5/ QUALIFIED VALUE, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

6/ TRUE VALUE, ELECTRON CAPTURE DETECTOR

7/ TRUE VALUE, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

8/ LOW RECOVERY, HALL ELECTROLYTIC CONDUCTIVITY DETECTOR

9/ QUALIFIED VALUE, FLAME IONIZATION DETECTOR

17/ TENTATIVE IDENTIFICATION

* ALGAL BIOASSAY SAMPLE

** THIS COMPOUND IS LISTED ON THE CONSENT DECREE, "LIST OF 65 TOXIC COMPOUNDS".

ND NONE DETECTED

## TABLE XV

### METAL CONCENTRATIONS DETECTED (UG/L)
TOXICITY STUDY
T.E. MAXSON WTP
OCTOBER 15-22, 1976

| SAMPLING DATE | SAMPLING TIME | TYPE OF SAMPLE | CD | CR | CU | PB | ZN | FE |
|---|---|---|---|---|---|---|---|---|
| 10/18 | 0755 | INFLUENT | <10 | <50 | 52 | <50 | 93 | 168 |
| 10/18 | 1330 | EFFLUENT | <10 | <50 | 13 | <50 | 41 | 278 |
| 10/20 | 1115 | INFLUENT | <10 | 50 | 87 | 50 | 169 | 1705 |
| 10/20 | 1035 | EFFLUENT | <10 | <50 | 23 | <50 | 50 | 831 |
| 10/20 | 1040 | DILUTION WATER | <10 | <50 | < 10 | <50 | 24 | 578 |
| 10/21 | 1045 | INFLUENT | <10 | <50 | 74 | <50 | 158 | 1230 |
| 10/22 | 0820 | INFLUENT | <10 | 59 | 125 | 72 | 240 | 2310 |
| 10/22 | 0930 | EFFLUENT | <10 | <50 | < 10 | <50 | 17 | 417 |

## INDUSTRIAL DISCHARGES

### Introduction

This section summarizes the industrial monitoring portion of the study, presents data for each source sampled, and describes the procedures which were used.

Wastewater samples were collected for two or more days between October 18 and 23, 1976, from thirty-six industries in the Nonconnah Creek Basin which were discharging into the WTP sewerage system. Additionally, ten industries that were discharging without treatment into the Mississippi River via the Presidents Island interceptor were sampled during October 25 through 28. This interceptor will discharge into the WTP upon its completion. Figure 1 shows the locations of all industrial sources sampled.

### Summary of Industrial Contributions

Industrial wastewater loadings discharged into the WTP from the Nonconnah Creek Basin are summarized in Table XVI. These industries contributed 48 percent of the $BOD_5$ and COD, and 36 percent of the TSS loads discharged into the WTP during the study. Those dischargers that contributed one percent or more of the total influent load of at least one of the measured pollutants into the WTP are listed in Table XVII. The few sources which were responsible for the bulk of the influent industrial waste loads were: $BOD_5$ (41%) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods; COD (43%) - Schlitz Brewing

Company, Ralston Purina, Valley Products; TSS (34%) - Schlitz Brewing Company, Ralston Purina, Valley Products, Hunt Wesson Foods, Frito-Lay, Kellogg. Table XVIII shows those sources that discharged toxic organic compounds included in EPA's Consent Decree, "65 Toxic Chemicals List" (4).

Table XIX summarizes the data collected during the industrial monitoring investigation in the Presidents Island Basin. Upon completion of its interceptor, significant increases in both biologically treatable and non-treatable pollutant loads will be discharged into the WTP.

The $BOD_5$, COD and TSS loadings discharged from the ten Presidents Island industries sampled represent approximately 20 percent of the current total influent load of these parameters which were discharged into the WTP. The chromium discharged from these industries exceeded the total chromium discharged into the WTP for the same period. Discharges of zinc were approximately one-third of the current zinc inflow.

## General Study Procedures

### Sampling Program--

Sampling programs were individually developed for each industrial discharge based on wastewater characteristics, continuity of flow, and the production or process schedule. Use of grab or composite wastewater samples was based upon flow continuity or wastewater strength for each discharger. Where wastewater flow was continuous, an ISCO model 1392 or 1580 automatic sampler was employed. The samplers were programmed to pump, at specified intervals, aliquots of wastewater into a refrigerated 2.5 or 3 gallon glass bottle. A minimum of two consecutive composites were collected, unless otherwise specified.

Grab sampling was conducted at industries where automatic sampling was neither feasible nor warranted. At least two grab samples were collected and composited daily for a minimum of two days, unless otherwise specified. In addition, grab samples were collected from each industry for in situ determinations of pH and temperature.

Samples for oil and grease, organics, phenols, and cyanide analyses were collected on a grab basis into special containers. These samples were preserved where required.

Samples were delivered daily to the US-EPA mobile laboratory located at the T. E. Maxson WTP. From acquisition until delivery, the samples were refrigerated and chain of custody was maintained.

Wastewater Flow Determinations--

Wastewater flow measurements for each industrial source were made using one or more of the following methods: (1) US-EPA and/or company-installed level recorders and weirs; (2) daily readings of Memphis Light Gas and Water (MLG&W) meters, or (3) flow estimates supplied by company personnel.

The most frequently used mode of flow measurement was the MLG&W water meters. The total wastewater discharge was determined from the total water usage by subtracting consumptive losses (usually based on company estimates) and/or separate cooling and sanitary wastewaters. Discharge of sanitary wastewaters from industrial sources was based on 30 gallons per day per person (6).

Unless otherwise specified, a 5-day work week was assumed to be 21.5 work days per month; a 7-day work week was 30.4 work days per month.

## Industries Investigated

The 36 Nonconnah Creek Basin industries were selected for sampling during a reconnaissance survey conducted by Surveillance and Analysis and Enforcement Division personnel during October 4 through 7, 1976. A list of 162 industries, supplied by the Deputy City Engineer, was reviewed by Memphis-Shelby County Health Department and Tennessee Department of Public Health Personnel. Their comments were noted and industrial dischargers not on the original list were added. The revised list was then evaluated as to the significance of the sources, based on the $BOD_5$, COD, presence of toxic substances or high wastewater flow volumes discharged into the collection system. From the original list of 162 industries, 73 were selected for on-site inspections. Thirty-six of the industries were subsequently sampled between October 18 and 23, 1976. The rejected sources discharged only cooling water, sanitary wastewater, or insignificant volumes of process wastewater. Industrial dischargers on or directly adjacent to Presidents Island were reviewed the week of October 25. Appendix E lists all industries which were considered and sampled.

Discussions follow for each industry sampled. Immediately following each discussion is the wastewater discharge data for each industry. (Note: Zeros shown in the loadings section of the tables are caused by computer rounding of loads calculated at less than one pound or kilogram.)

TABLE XVI (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

| INDUSTRY | SAMPLE LOCATION NO | OPERATING SCHEDULE | CHROMIUM | COPPER | CADMIUM | IRON | ZINC | LEAD | NICKEL | ALUMINUM | MERCURY | SILVER | ANTIMONY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIMCO AUTO PRODUCTS | M-2A | 5 DAYS/WK | 15.2 | 0.66 | 0.05 | 2.55 | 4.84 | 0.11 | < .01 | -- | -- | -- | -- |
| REFINED METALS | M-3 | 5 DAYS/WK | < 0.01 | 0.09 | .02 | 0.36 | 0.09 | 0.35 | 0.02 | -- | -- | < .01 | 0.26 |
| DIXIE LITHO PLATE. | M-11 | 5 DAYS/WK | 4.69 | 0.89 | < 0.01 | -- | 29.1 | 0.02 | 0.01 | -- | -- | <0.01 | -- |
| ALCO GRAVURE | M-12 | 5 DAYS/WK | 0.26 | 0.59 | < 0.01 | 9.68 | 0.06 | 0.03 | <0.02 | -- | -- | -- | -- |
| CHAPMAN CHEMICAL | M-16 | 5 DAYS/WK | < 0.01 | < 0.01 | < 0.01 | -- | 0.01 | 0.02 | < .01 | -- | < .01 | -- | -- |
| RAINBO PHOTO SERVICE | M-19 | 5.5DAYS/WK | < 0.01 | 0.01 | < 0.01 | -- | 0.01 | 0.01 | < .01 | -- | -- | 0.17 | -- |
| RICHARDS MFG | M-20 | 5 DAYS/WK | 0.06 | 0.13 | < 0.01 | -- | 0.05 | 0.03 | 0.03 | -- | -- | -- | -- |
| CLEO WRAP | M-26 | 5 DAYS/WK | 2.10 | 0.02 | < 0.01 | -- | 0.50 | 0.05 | < .01 | -- | -- | -- | -- |
| D & W PLATING | M-27 | 5 DAYS/WK | 3.54 | 0.14 | 0.86 | -- | 12.6 | -- | 0.72 | -- | -- | -- | -- |
| GENERAL CABLE | M-39 | 5 DAYS/WK | < 0.02 | 0.01 | < 0.01 | -- | 0.06 | <0.04 | <0.01 | 0.04 | -- | -- | -- |
| GOULD | M-40 | 5 DAYS/WK | < 0.02 | 0.06 | < 0.01 | -- | 0.06 | 7.7 | 0.02 | -- | -- | -- | -- |
| HUNT WESSON | M-43 | 7 DAYS/WK | < 0.06 | 0.4 | < 0.1 | -- | 0.06 | <1 | 0.8 | -- | -- | -- | -- |
| MEMPHIS FURNITURE | M-46 | 5 DAYS/WK | < 0.01 | < 0.01 | < 0.01 | -- | < .01 | < .01 | < .01 | -- | -- | -- | -- |
| TOTAL LOAD | | | 25.9 | 3.00 | 0.93 | 12.6 | 47.4 | 8.31 | 1.6 | 0.04 | < .01 | 0.17 | 0.26 |

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## TABLE XVI

### INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

| INDUSTRY | SAMPLE LOCATION NO | OPERATING SCHEDULE | BOD5 | COD | TSS | TKN | NH3 | TOTAL P | SO4 | CYANIDE |
|---|---|---|---|---|---|---|---|---|---|---|
| DELTA REFINING | M-1 | 7 DAYS/WK | 1020 | 1650 | 139 | -- | -- | -- | -- | -- |
| KIMCO AUTO PRODUCTS | M-2A | 5 DAYS/WK | -- | <13 | 18.7 | -- | -- | -- | 2.86 | -- |
| REFINED METALS | M-3 | 5 DAYS/WK | -- | 2.5 | -- | -- | 740.0 | -- | 1370 | -- |
| SHULTON INC | M-5 | 5 DAYS/WK | > 3.7* | 55.5 | 20 | -- | -- | -- | -- | -- |
| UNITED PAINT | M-6 | 5 DAYS/WK | < 5 | 6 | 8 | -- | -- | -- | -- | -- |
| DIXIE LITHO PLATE | M-11 | 5 DAYS/WK | -- | 304 | -- | -- | -- | -- | -- | -- |
| ALCO GRAVURE | M-12 | 5 DAYS/WK | 126 | 386 | 17.0 | -- | -- | -- | -- | -- |
| QUALITY INDUSTRIAL UNIFORM | M-14 | 5 DAYS/WK | 151 | 824 | 173 | -- | -- | 0.755 | -- | -- |
| VALLEY PRODUCTS | M-15 | 3 DAYS/WK | 11800 | 21300 | 2330 | -- | -- | -- | 3210 | -- |
| CHAPMAN CHEMICAL | M-16 | 5 DAYS/WK | -- | 8.5 | 3.5 | -- | -- | -- | -- | -- |
| ILLINOIS CENTRAL GULF RR | M-17 | 7 DAYS/WK | < 34.6 | 118 | 81 | -- | -- | -- | -- | -- |
| RAINBOW PHOTO SERV. | M-19 | 5.5DAYS/WK | 39.8 | 54 | < 0.22 | -- | -- | -- | -- | -- |
| RICHARDS MFG | M-20 | 5 DAYS/WK | < 42.1 | 35.5 | 24.5 | -- | -- | -- | -- | -- |
| NATIONAL STARCH & CHEM | M-21 | 5 DAYS/WK | 133 | 747 | 212 | -- | -- | -- | -- | -- |
| UTREX | M-22 | 5 DAYS/WK | 22.6 | 80.5 | 16.7 | -- | -- | 0.75 | -- | -- |
| CLEO WRAP CORP | M-26 | 5 DAYS/WK | -- | 4.3 | 7.4 | -- | -- | -- | -- | 0.001 |
| D & W PLATING | M-27 | 5 DAYS/WK | -- | -- | 60.1 | -- | -- | 4.18 | -- | 6.6 |
| DELTA FOREMOST | M-28 | 5 DAYS/WK | 242 | 504 | 11.8 | 1.04 | -- | 15.8 | -- | -- |
| J.M. SMUCKER | M-29 | 5 DAYS/WK | 1580 | 3790 | 153 | -- | -- | 6.97 | -- | -- |
| RALSTON PURINA | M-32 | 7 DAYS/WK | 22100 | 47900 | 8700 | -- | -- | -- | -- | -- |
| JOS. SCHILTZ BREWING | M-33 | 5.5DAYS/WK | 38800 | 61000 | 19600 | 651 | -- | 297 | -- | -- |
| FRITO LAY | M-38 | 5 DAYS/WK | 1220 | 6840 | 4170 | -- | -- | -- | -- | -- |
| GENERAL CABLE | M-39 | 5 DAYS/WK | -- | <19 | -- | -- | -- | -- | -- | -- |
| GOULD INC | M-40 | 5 DAYS/WK | -- | -- | 30 | -- | -- | -- | 1180 | -- |
| HIGHS ICE CREAM | M-41 | 4 DAYS/WK | 493 | 865 | 52 | -- | -- | -- | -- | -- |
| HUNTER FAN & VENT | M-42 | 5 DAYS/WK | -- | <28 | -- | -- | -- | 4.8 | -- | -- |
| HUNT WESSON | M-43 | 7 DAYS/WK | 13400 | 14900 | 3370 | -- | -- | 55 | 1500 | -- |
| KELLOGG | M-44 | 7 DAYS/WK | 7030 | 14000 | 2450 | -- | -- | -- | -- | -- |
| KROGER MEAT | M-45 | 6 DAYS/WK | 7 | 12 | 2 | -- | -- | -- | -- | -- |
| MEMPHIS FURNITURE | M-46 | 5 DAYS/WK | < 2.8 | 4 | 4 | -- | -- | -- | -- | -- |
| MIDWEST FARMS | M-47 | 5 DAYS/WK | 392 | 637 | 147 | -- | -- | -- | -- | -- |
| CROWN ZELLERBACK | M-51 | 5 DAYS/WK | 22.6 | 35.0 | 17 | -- | -- | -- | -- | -- |
| KLINKE BROS ICE CREAM | M-56 | 5 DAYS/WK | 248 | 481 | 101 | -- | -- | -- | -- | -- |
| KEATHLEY | M-67 | 5 DAYS/WK | >220 | 749 | 184 | -- | -- | -- | -- | -- |
| J. STRICKLAND | M-71 | 5 DAYS/WK | < 40 | 64 | -- | -- | -- | -- | -- | -- |
| PRO-SERV** | M-73 | 5 DAYS/WK | -- | 966 | 362 | -- | -- | -- | -- | -- |
| TOTAL | | | 99100 | 178000 | 42500 | 652 | 740.0 | 385 | 7260 | 6.6 |

* TOXIC TO BOD5 TEST
** BATCH DISCHARGE

TABLE XVI (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

| COMPOUND | SAMPLE LOCATION NO. M-1 | M-5 | M-12 | M-14 | M-15 | M-16 | M-17 | M-20 | M-21 | M-22 | M-26 | M-28 | M-32 | M-33 | M-39 | M-42 | M-43 | M-45 | M-71 | M-73 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OIL AND GREASE | 309 | | 0.29 | 515 | 356.0 | | 14.0 | 4.9 | 40.9 | 22.9 | 0.04 | 84.5 | 148 | 503 | 6.0 | 194 | 16400 | 1.2 | 2.8 | |
| PHENOL * | 233 | ND | | | ND | | | | 0.39 | | | 1.66 | | | | | 3 | | | ND |
| CHLOROFORM * | | ND | | | ND | ND | | | ND | | | | | | | | | | | 0.01 |
| BENZENE * | | ND | | | ND | 0.040 | | | ND | | | | | | | | | | | ND |
| DIISOPROPYL ETHER | | ND | | | ND | 0.013 | | | ND | | | | | | | | | | | ND |
| PENTANE | | < .01 | | | ND | ND | | | ND | | | | | | | | | | | ND |
| TRICHLOROETHYLENE * | | ND | | | ND | ND | | | 13.6 | | | | | | | | | | | 0.08 |
| TOLUENE * | | ND | | | ND | ND | | | ND | | | | | | | | | | | 0.02 |
| ETHYL BENZENE * | | ND | | | ND | ND | | | ND | | | | | | | | | | | 0.05 |
| ISOMER OF XYLENE | | ND | | | ND | <0.01 | | | ND | | | | | | | | | | | 0.07 |
| ACETONE | | ND | | | 0.98 | 23.4 | | | 31.3 | | | | | | | | | | | ND |
| N-PROPYL ALCOHOL | | ND | | | 0.40 | ND | | | ND | | | | | | | | | | | ND |
| METHYL ETHYL KETONE | | ND | | | 0.08 | ND | | | ND | | | | | | | | | | | ND |
| ETHYL ACETONE | | ND | | | 0.04 | ND | | | ND | | | | | | | | | | | ND |
| METHYL CYCLOPENTANE | | ND | | | 0.04 | 0.31 | | | ND | | | | | | | | | | | ND |
| HEXANE | | ND | | | 0.08 | 0.81 | | | 2.40 | | | | | | | | | | | ND |
| METHYLENE CHLORIDE * | | ND | | | ND | 2.18 | | | 7.26 | | | | | | | | | | | 0.06 |
| N-PROPYL BENZENE | | ND | | | ND | | | | ND | | | | | | | | | | | 0.01 |
| ISOMER OF TERPINEOL | | <0.01 | | | ND | | | | ND | | | | | | | | | | | ND |
| N,N DIISOPROPYL ANILINE | | ND | | | ND | | | | ND | | | | | | | | | | | 3.79 |
| BUTYL BENZYL PHTHALATE * | | ND | | | ND | | | | 1.38 | | | | | | | | | | | ND |
| ISOMER OF PINENE | | <0.01 | | | ND | | | | ND | | | | | | | | | | | ND |
| LIMONENE | | 0.01 | | | ND | | | | ND | | | | | | | | | | | ND |
| ISOMER OF TERPINENE | | <0.01 | | | ND | | | | ND | | | | | | | | | | | ND |
| ISOMER OF TRICHLOROETHANE * | | ND | | | ND | ND | | | ND | | | | | | | | | | | ND |
| ACETONITRILE | | ND | | | ND | | | | ND | | | | | | | | | | | ND |
| TETRACHLOROETHYLENE * | | ND | | | ND | ND | | | ND | | | | | | | | | | | ND |
| RAMROD | | | | | | | | | | | | | | | | | | | | 1520 |
| CHLORDANE * | | | | | | | | | | | | | | | | | | | | 54.2 |
| PROMETON | | | | | | | | | | | | | | | | | | | | 0.51 |
| ATRAZINE | | | | | | | | | | | | | | | | | | | | 0.28 |

* - ON CONSENT DECREE '65 TOXIC CHEMICALS LIST'

ND - NONE DETECTED

## TABLE XVII

### INDUSTRIAL DISCHARGERS CONTRIBUTING ONE PERCENT OR MORE OF INDICATED PARAMETER
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

| | | PARAMETERS EXCEEDING 1 % OF INFLUENT STP LOADING (LBS/DAY) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BOD | COD | TSS | TKN | NH3 | TOTAL P | CR | CU | ZN | PB | NI | CD | O&G |
| 1% CRITERIA * | | 2090 | 3692 | 1191 | 118.4 | 44.3 | 55.7 | 0.24 | 0.38 | 0.92 | 0.53 | 0.08 | <.03 | 120 |
| INDUSTRY | SAMPLE LOCATION NO | | | | | | | | | | | | | |
| DELTA REFINING | M-1 | | | | | | | | | | | | | 309 |
| KIMCO AUTO | M-2 | | | | | | | 15.2 | 0.66 | 4.84 | | | .053 | |
| REFINED METALS | M-3 | | | | | 740 | | | | | | | | |
| DIXIE LITHO PLATE | M-11 | | | | | | | 4.69 | 0.88 | 29.1 | | | | |
| ALCO - GRAVURE | M-12 | | | | | | | 0.26 | 0.58 | | | | | |
| QUALITY IND. UNIF. | M-14 | | | | | | | | | | | | | 515 |
| VALLEY PRODUCTS | M-15 | 11800 | 21300 | 2330 | | | | | | | | | | 356 |
| CLEO WRAP | M-26 | | | | | | | 2.10 | | | | | | |
| D&W PLATING | M-27 | | | | | | | 3.53 | | 12.6 | | 0.72 | 0.86 | |
| J. M. SMUCKER | M-29 | | 3790 | | | | | | | | | | | |
| RALSTON PURINA | M-32 | 22100 | 47900 | 8700 | | | | | | | | | | 148 |
| JOS SCHLITZ BREWING | M-33 | 38800 | 61000 | 9630 | 631 | | 297 | | | | | | | 503 |
| FRITO-LAY | M-38 | 6840 | 4170 | | | | | | | | | | | |
| GOULD INC. | M-40 | | | | | | | | | | 7.7 | | | |
| HUNTER FAN & VENT. | M-42 | | | | | | | | | | | | | 194 |
| HUNT WESSON | M-43 | 13400 | 14900 | 3370 | | | | | 0.4 | | | 0.8 | | 16400 |
| KELLOGG | M-44 | 7030 | 14000 | 2450 | | | | | | | | | | |
| PRESIDENTS ISLAND | | | | | | | | | | | | | | |
| CARGILL | M-81 | 33200 | 60600 | 13800 | 820 | | 195 | | | | | | | |
| ARMOUR | M-83 | 9130 | 16700 | 5400 | 475 | 114 | 111 | | | | | | | |
| UNARCO | M-85 | | | | | | | 23.00 | | 0.99 | | 5.12 | | |
| FAITH MEMPHIS | M-87 | | | | | | | 14.0 | | | | 13 | | |

* THESE FIGURES ARE ONE PERCENT OF THE INFLUENT LOAD MEASURED AT THE WTP DURING THE MONDAY THROUGH FRIDAY SAMPLING PERIOD.

## TABLE XVIII

### INDUSTRIAL SOURCES DISCHARGING TOXIC CHEMICALS*
NONCONNAH CREEK BASIN
MEMPHIS, TENNESSEE
OCTOBER 1976

| INDUSTRY | SAMPLE LOCATION NO | CHLOROFORM | BENZENE | TRICHLORO ETHYLENE | TOLUENE | ETHYL BENZENE | METHYLENE CHLORIDE | CHLORDANE | BUTYL BENZYL PHTHALATE | PHENOL | DIETHYL PHTHALATE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DELTA REFINING | M-1 | | | | | | | | | 233 | 5 |
| SHULTON | M-5 | | | | | | | | | | |
| CHAPMAN CHEMICAL | M-16 | | .09 | | | | 2.18 | | | | |
| NATIONAL STARCH | M-21 | | | 13.6 | | | 7.26 | | 1.38 | 0.39 | |
| DELTA FOREMOST | M-28 | | | | | | | | | 1.66 | |
| HUNT WESSON | M-43 | | | | | | | | | 3 | |
| PRO-SERV | M-73 | 0.01 | | 0.08 | 0.02 | 0.05 | 0.06 | 54.2 | | | |

* EPA'S CONSENT DECREE ''65 TOXIC CHEMICALS LIST''

## TABLE XIX

### INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
### PRESIDENTS ISLAND INTERCEPTOR
### MEMPHIS, TENNESSEE
### OCTOBER 1976

| INDUSTRY | SAMPLE LOCATION NO | OPERATING SCHEDULE | BOD5 | COD | TSS | TKN | NH3 | TOTAL P | CYANIDE |
|---|---|---|---|---|---|---|---|---|---|
| CARGILL (SOYBEAN) | M-80 | 7 DAYS/WK | 853 | 1470 | 97 | 5.3 | 4.7 | 0.72 | -- |
| CARGILL (CORN SYRUP) | M-81 | 7 DAYS/WK | 33200 | 60300 | 13800 | 820 | 12 | 195 | -- |
| MID-SOUTH METAL PLATING | M-82 | 5 DAYS/WK | -- | 92 | 95 | -- | -- | -- | 16.7* |
| ARMOUR | M-83 | 5 DAYS/WK | 9130 | 16700 | 5400 | 475 | 114 | 111 | -- |
| MEMPHIS BUTCHERS | M-84 | 5 DAYS/WK | 932 | 1550 | 418 | 55.3 | 13.1 | 12.6 | -- |
| UNARCO | M-85 | 5 DAYS/WK | -- | <22 | 22.5 | -- | -- | -- | <0.001 |
| NAT BURING | M-86 | 5 DAYS/WK | 863 | 1240 | 909 | 16.5 | 2.0 | 15.4 | -- |
| FAITH MEMPHIS | M-87 | 5 DAYS/WK | -- | <18 | 38 | -- | -- | -- | -- |
| MILLER TRANSPORTERS | M-88 | 7 DAYS/WK | <150 | 320 | 86 | 6.3 | 3.8 | 5.5 | -- |
| CBI NUCLEAR | M-89 | 5 DAYS/WK | <628 | 116 | 73 | -- | -- | -- | -- |
| TOTAL** | | | 45000 | 81800 | 20900 | 1380 | 150 | 340 | 16.7 |

* APPROXIMATION OF LOAD, IE LOAD CALCULATED WITH INSTANTANEOUS GRABS & AVERAGE OF DAILY DISCHARGE FLOWS

** TOTALS DO NOT INCLUDE < (LESS THAN) VALUES.

## TABLE XIX (CONTINUED)

INDUSTRIAL WASTEWATER LOADINGS (LB/DAY)
PRESIDENTS ISLAND INTERCEPTOR
MEMPHIS, TENNESSEE
OCTOBER 1976

| INDUSTRY | SAMPLE LOCATION NO | OPERATING SCHEDULE | CHROMIUM | COPPER | CADMIUM | IRON | ZINC | LEAD | NICKEL | SILVER |
|---|---|---|---|---|---|---|---|---|---|---|
| MID-SOUTH METAL PLATING | M-82 | 5 DAYS/WK | 1 | 0.1 | 1.7 | 17 | 31 | 0.04 | 0.2 | -- |
| UNARCO INDUSTRIES | M-85 | 5 DAYS/WK | 23.0 | 0.13 | <0.01 | -- | 0.99 | 0.07 | 5.12 | -- |
| FAITH MEMPHIS | M-87 | 5 DAYS/WK | 14 | 0.08 | <0.01 | -- | 0.03 | 0.06 | 13 | -- |
| MILLER TRANSPORTERS | M-88 | 5 DAYS/WK | 0.04 | 0.06 | <0.01 | -- | 0.05 | 0.06 | < 0.01 | -- |
| CBI NUCLEAR | M-89 | 5 DAYS/WK | 0.02 | 0.08 | <0.01 | -- | 0.14 | <0.07 | 0.06 | 0.02 |
| TOTAL LOAD | | | 38.1 | 0.45 | 1.7 | 17 | 32.2 | 0.23 | 18.4 | 0.02 |

# NONCONNAH CREEK BASIN

### Delta Refining Company--

#### Introduction--

Delta Refining Company, located at 543 West Mallory, operates an oil and gasoline refinery continuously with a staff of 200 people. Crude oil is taken through a standard refining operation to primary finished products of oil and gasoline.

#### Wastewaters and Pretreatment Processes--

Sanitary wastes are discharged into septic tank/leachfield systems. Process wastes are pretreated with an API separator, an air flotation unit, and a settling pond prior to discharge through a 90° V-notch weir with a concomitant recorder.

The company grab samples the effluent three times per week. Listed below are the results of the last three months' sampling:

| Date | TSS(mg/1) | BOD(mg/1) | pH | O&G(mg/1) | Temp(°C) | Flow(mgd) |
|---|---|---|---|---|---|---|
| 7/76 | 31.4 | 908 | 8.5 | 133.1 | 42 | 0.415 |
| 8/76 | 39.3 | 965 | 9.5 | 91.7 | 43 | 0.170 |
| 9/76 | 96.5 | 724 | 8.9 | 135.4 | 42 | 0.082 |

#### Results--

Three consecutive 24-hour composite samples were collected at the settling pond effluent (Location M-1) by means of an automatic sampler. Samples were collected at 15-minute intervals. Flows were determined by using the company's 90° V-notch weir and an EPA installed stage recorder. Operation was considered normal during the sampling period by company personnel. Wastewater loadings are given in Table XX.

Phenol and oil and grease loadings were 116 and 2.6 percent, respectively, of the total phenol and oil and grease loadings into the WTP.

The discrepancy between the phenol loading from this facility and the total phenol loading to the WTP can be attributed to biodegradation and volatization in the collection system. (Facility loading was 116% of total WTP load.)

TABLE XX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
DELTA REFINING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | PHENOLS TOTAL UG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M01 | 761018 | 1445 | (C)761019 | 1315 | 0.277 | | | 410.0 | | 19 | 524 | |
| M01 | | | 761019 | 1320 | | 35.0 | 8.6 | | 77500 | | | 62.00 |
| M01 | 761019 | 1445 | (C)761020 | 1420 | 0.327 | | | 315.0 | | 37 | 484 | |
| M01 | | | 761020 | 1430 | | 32.0 | 11.0 | | 77500 | | | 67.00 |
| M01 | 761020 | 1430 | (C)761021 | 1430 | 0.278 | | | 520.0 | | 114 | 1008 | 22.00 |
| M01 | | | 761021 | 1440 | | 35.0 | 9.1 | | 130000 | | | 249.00 |

************************************************************ LOADINGS ************************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | PHENOLS TOTAL LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M01 | 761018 | 1445 | (C)761019 | 1315 | 0.277 | 947.8 | | 44 | 1211 | |
| M01 | 761019 | 1445 | (C)761020 | 1420 | 0.327 | 859.6 | 232.94* | 101 | 1321 | 308.95* |
| M01 | 761020 | 1430 | (C)761021 | 1430 | 0.278 | 1206.4 | | 264 | 2339 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | PHENOLS TOTAL KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M01 | 761018 | 1445 | (C)761019 | 1315 | 0.277 | 429.9 | | 20 | 549 | |
| M01 | 761019 | 1445 | (C)761020 | 1420 | 0.327 | 389.9 | | 46 | 599 | |
| M01 | 761020 | 1430 | (C)761021 | 1430 | 0.278 | 547.2 | | 120 | 1061 | 23.15 |

* APPROXIMATION OF LOADS (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW).

## Kimco Auto Products, Incorporated--

### Introduction--

Kimco Auto Products is an automotive parts rebuilding company, located at 1520 Texas Street, which employs about 550 people; 120 are involved in the parts recovery operation. The facility operates on a five day per week, eight hour per day schedule. This operation consists of rebuilding carburetors and clutches. Used clutches are process-dipped into a series of treatment units, i.e., degreasing, caustic (90% alkali), clear water rinse, and rust inhibitor (90% varsol solution).

Carburetors are processed in the following treatment order: they are first etched with a muriatic and sulphuric acid solution, then dipped in a chromic acid tank, clear water rinsed, and finally dried.

### Wastewater Discharges and Pretreatment Processes--

Continuous overflow rinse tanks on the carburetor and clutch lines are the major source of industrial wastewater. The remaining wastewater flow is from sanitary usage, parts recovery, boiler and compressor discharges Pretreatment at the facility consists of two sump tanks which provide settling.

### Results--

Two consecutive composite samples and one grab sample were pumped from the sewer cleanout (M-2A) in front of building 1570 (parts recovery) during October 19 and 21, 1976. Samples were collected at one-half-hour intervals for six to seven hours during the production period. A grab sample was taken the first day of the three-day investigation due to a malfunction of the automatic sampler.

Flows were determined from daily MLG&W water meter readings. Wastewater loadings discharged from the plant were determined from the composite parameter concentrations and total flow during the production period.

Company records indicate an average monthly water usage of 55,000 cubic feet, based upon the average of the previous five months. This equates to a daily usage of 19,130 gallons per day. Discharge flows during the study were 14,615 gpd, 17,503 gpd, and 16,792 gpd for an 8.5 hour production schedule. Company personnel indicated that operation during the study should be considered typical. Analytical results are presented in Table XXI.

This facility is a major contributor of chromium, zinc, and cadmium. Discharges represent 63 percent of the chromium, 5 percent of the nickel, and 1.7 percent of the cadmium load discharged to the WTP during the study. Biological treatment processes, such as those employed at this WTP, are not specifically designed to remove heavy metals.

TABLE XXI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KIMCO AUTO PARTS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 0.017 | | | 68 | 40< | 247600 | 64[illegible] |
| M02A | | | 761019 | 1015 | 0.015 | 22.0 | 9.3 | 272 | 222 | 28000 | 16670 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 0.017 | | | 90 | 40< | 42000 | 21760 |

| STATION | DATE | TIME | DATE | TIME | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | IRON FE,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SULFATE SO4-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 12180 | 1330 | 37760 | 228 | 1028 | 32 |
| M02A | | | 761019 | 1015 | 785 | 904 | 11780 | 20< | 45 | 18 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 661 | 188 | 4920 | 24 | 35 | 18 |

************************************ LOADINGS ************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 0.017 | 10 | 6< | 36 | 9 | 2 |
| M02A | | | 761019 | 1015 | 0.015 | 33 | 27 | 3 | 2 | 0 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 0.017 | 13 | 6< | 6 | 3 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT LB/D | IRON FE,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SULFATE SO4-TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 0.017 | 0 | 6 | 0 | 0 | 5 |
| M02A | | | 761019 | 1015 | 0.015 | 0 | 1 | 0 | 0 | 2 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 0.017 | 0 | 1 | 0 | 0 | 3 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 0.017 | 5 | 3< | 16 | 4 | 1 |
| M02A | | | 761019 | 1015 | 0.015 | 15 | 12 | 2 | 1 | 0 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 0.017 | 6 | 3< | 3 | 1 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT KG/D | IRON FE,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SULFATE SO4-TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M02A | 761019 | 1000 | (C)761019 | 1700 | 0.017 | 0 | 3 | 0 | 0 | 2 |
| M02A | | | 761019 | 1015 | 0.015 | 0 | 1 | 0 | 0 | 1 |
| M02A | 761020 | 1020 | (C)761020 | 1630 | 0.017 | 0 | 0 | 0 | 0 | 1 |

### Refined Metals Corporation--

### Introduction--

Refined Metals located at 257 W. Mallory, operates a lead recovery and processing operation with a work force of thirty people. The operation consists of two eight-hour shifts, Monday through Friday, and one eight-hour shift on Saturday.

This operation is classified as a "secondary lead smelting". Lead plate automotive-type batteries are processed to recover lead. The lead is then melted, refined, and sold as ingots. Battery acids are wasted to the sewer in the process. The company plans to install an acid recovery system in the future. No date, however, has been set for its installation.

### Wastewater Discharges and Pretreatment Processes--

Wastewater from the production facility is primarily acid fluid from the battery braking operation. Pretreatment consists of neutralizing with gaseous ammonia and settling. Sanitary wastes are discharged directly into the city sewer.

### Results--

Four 10-14 hour composite samples were taken at half-hour intervals from the wastewater sump (M-3) between October 19 through 23, 1976. Flows were determined with an EPA-installed stage recorder on the final effluent. Wastewaters were discharged from the final sump by means of a float and a pump.

Loads in Table XXII were calculated from the composite parameter concentrations and the EPA-measured flow. Company personnel considered operations normal during the sampling period.

Lead and cadmium loadings constituted nearly one percent of the total lead and cadmium discharged into the WTP. Ammonia loadings were greater than 15 percent of the total ammonia discharged into the WTP. During the study period, the company's ammonia neutralization system was not operating properly. The contact stabilization treatment process employed at the WTP is not specifically designed to treat heavy metals, ammonia, or sulfates. In addition, sulfate concentrations were very significant (i.e., 25,000 to 60,000 mg/l).

# TABLE XXII
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
REFINED METALS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | NH3-N TOTAL MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 0.005 | | | 17500.00 | 68 | 60 | 1675 | 2750 |
| M03 | | | 761020 | | | 6.5 | 11.2 | | | | | |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 0.003 | | | 38000.00 | 88 | 76 | 2900 | 1950 |
| M03 | | | 761021 | 1430 | | 18.0 | 9.6 | | | | | |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 0.002 | | | 18000.00 | 74 | 50< | 3275 | 2825 |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 0.004 | | | 17500.00 | 72 | 315 | 3450 | 3900 |
| M03 | | | 761023 | 1050 | | 20.5 | 8.7 | | | | | |

| STATION | DATE | TIME | DATE | TIME | LEAD PB,TOT UG/L | IRON FE,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SILVER AG,TOT UG/L | SULFATE SO4-TOT MG/L | ANTIMONY SB,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 5725 | 2620 | 727 | 552 | 22 | 34000 | 6900 |
| M03 | | | 761020 | | | | | | | | |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 15200 | 4850 | 584 | 488 | 20< | 25000 | 4150 |
| M03 | | | 761021 | 1430 | | | | | | | |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 2881 | 1875 | 950 | 656 | | 50000 | |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 19500 | 3500 | 625 | 862 | | 60000 | 12980 |
| M03 | | | 761023 | 1050 | | | | | | | |

## LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NH3-N TOTAL LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 0.005 | 803.23 | 3 | 0 | 0 | 0 | 0 |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 0.003 | 1046.50 | 2 | 0 | 0 | 0 | 0 |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 0.002 | 315.45 | 1 | 0< | 0 | 0 | 0 |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 0.004 | 627.98 | 3 | 0 | 0 | 0 | 1 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | IRON FE,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SILVER AG,TOT LB/D | SULFATE SO4-TOT LB/D | ANTIMONY SB,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 0.005 | 0 | 0 | 0 | 0 | 1561 | 0 |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 0.003 | 0 | 0 | 0 | 0< | 688 | 0 |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 0.002 | 0 | 0 | 0 | | 876 | |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 0.004 | 0 | 0 | 0 | | 2153 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NH3-N TOTAL KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 0.005 | 364.34 | 1 | 0 | 0 | 0 | 0 |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 0.003 | 474.68 | 1 | 0 | 0 | 0 | 0 |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 0.002 | 143.09 | 1 | 0< | 0 | 0 | 0 |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 0.004 | 284.85 | 1 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | IRON FE,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SILVER AG,TOT KG/D | SULFATE SO4-TOT KG/D | ANTIMONY SB,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M03 | 761019 | 1400 | (C)761019 | 2400 | 0.005 | 0 | 0 | 0 | 0 | 708 | 0 |
| M03 | 761020 | 1400 | (C)761020 | 2400 | 0.003 | 0 | 0 | 0 | 0< | 312 | 0 |
| M03 | 761021 | 1430 | (C)761021 | 2400 | 0.002 | 0 | 0 | 0 | | 397 | |
| M03 | 761022 | 0900 | (C)761022 | 2400 | 0.004 | 0 | 0 | 0 | | 977 | 0 |

### Shulton Incorporated--

### Introduction--

This facility is located at 1725 South Third Street. The company employs 50 people in a five-day-a-week, eight or sixteen-hour-per-day operation, depending on the seasonal demand. Shulton Incorporated manufactures alcohol-based lotion and aerosol products requiring a formulation of alcohols and propellants (hydrocarbons - fluorocarbons) as raw product sources.

### Wastewater Discharges and Pretreatment Processes--

Wastewaters are generated from the washdown of vats between product changeovers. Compressor cooling water, chiller system water, and sanitary wastewater are on a separate line and were not sampled. A grease sump tank provided pretreatment for the washdown line. The tank is pumped twice a year by a septic service. The method of ultimate disposal of these solids by the septic tank service is unknown.

### Results--

Product wastewater was sampled from the sump tank. This site (M-5) was sampled on two consecutive days for 14-hour sampling periods at half-hour intervals. Flow was determined from daily MLG&W water meter readings minus daily domestic consumption, compressor cooling, and chiller system waters. Compressor cooling, domestic consumption, and chiller system wastewaters accounted for an estimated 90 percent of the total raw water usage.

Company records indicated an average monthly usage of 148,300 cubic feet of water based on the last four months. This equates to a daily usage of 51,595 gpd. Discharge flows were 33,054 gpd during October 18 through 19 and 28,828 gpd during October 19 through 20. Discharge flows used in the loading analysis (losses considered) were 3,305 gpd and 2,882 gpd, respectively (Table XXIII). Operation during the period of study was considered normal by company personnel, and wastewater discharges were assumed typical.

Several terpines and diethyl phthalates were detected in the wastewater. Diethyl phthalate is on the EPA's Consent Decree: "65 Toxic Chemicals List". The wastewater constituents were toxic to the $BOD_5$ test on the first day of the two-day sampling period.

## TABLE XXIII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
SHULTON INC.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M05 | 761018 | 1100 | (C)761018 | 2300 | 0.003 | | | 200.0> | 1330 | 3582 |
| M05 | 761019 | 0930 | (C)761019 | 2330 | 0.003 | | | 80.0 | 132 | 504 |
| M05 | | | 761019 | 0950 | | 24.0 | 6.2 | | | |
| M05 | | | 761020 | 0955 | | 24.0 | 6.4 | | | |

****************************************** LOADINGS ******************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M05 | 761018 | 1100 | (C)761018 | 2300 | 0.003 | 5.5> | 37 | 99 |
| M05 | 761019 | 0930 | (C)761019 | 2330 | 0.003 | 1.9 | 3 | 12 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M05 | 761018 | 1100 | (C)761018 | 2300 | 0.003 | 2.5> | 17 | 45 |
| M05 | 761019 | 0930 | (C)761019 | 2330 | 0.003 | 0.9 | 1 | 5 |

### United Paint Company, Incorporated--

#### Introduction--

The United Paint plant, located at 404 East Mallory Avenue, manufactures latex paints. Operations are conducted on one eight-hour shift, five days per week with approximately 50 employees.

The latex paint manufacturing process consists of blending ground pigments, wetting agents, latex and water.

#### Wastewater Discharges and Pretreatment Processes--

The main sources of wastewater are cooling water and wash water from the cleaning of paint mixing tanks. This water passes through a sump before discharging into the city system. Sludge and skimmings from the sump are removed when necessary, and taken to a dump. Sanitary wastewater discharges into the city system separately from the process wastewater.

#### Results--

Two eight-hour composite samples, collected at two-hour intervals, were collected on two consecutive days (October 20 and 21, 1976) from the sump (M-6). Flows were determined by reading the MLG&W meter and subtracting the water added to the paint product plus the estimated volume of sanitary wastewaters. Water added to the paint product was supplied by company personnel each day. Wastewater loads were determined from composite parameter concentrations and the calculated flows (Table XXIV).

The two most recent water bills averaged 259,180 gallons per month. Based on a 22 work-day month, this amounted to 11,780 gallons per day.

Raw water used during the sampling period was 9,800 gallons per day and 7,000 gallons per day, respectively. The operation was considered normal by company personnel during the sampling. However, since the flows were lower than those during the recent period, the loads discharged during the sampling period are assumed to be less than normal.

This discharger's wastewater is compatible with domestic sewage; the low concentrations and flow relegate it to a very minor contributor status.

## TABLE XXIV
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UNITED PAINT
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M06 | | | 761019 | 1345 | | 20.0 | 6.5 | | | |
| M06 | 761020 | 0800 | (C)761020 | 1630 | 0.009 | | | 67.0< | 170 | 70 |
| M06 | 761021 | 0800 | (C)761021 | 1630 | 0.006 | | | 67.0< | 81 | 113 |
| M06 | | | 761022 | 0820 | | 22.0 | 6.5 | | | |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M06 | 761020 | 0800 | (C)761020 | 1630 | 0.909 | 5.0< | 13 | 5 |
| M06 | 761021 | 0800 | (C)761021 | 1630 | 0.006 | 3.4< | 4 | 6 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M06 | 761020 | 0800 | (C)761020 | 1630 | 0.009 | 2.3< | 6 | 2 |
| M06 | 761021 | 0800 | (C)761021 | 1630 | 0.006 | 1.5< | 2 | 3 |

Dixie Litho Plate, Inc.--

Introduction--

Dixie Litho Plate is a lithographic negative and printing plate manufacturer located at 3021 Carrier Street. The facility employs eighteen people in a five day per week, eight hour per day operation. Three steps are involved in preparing the plates. First, the plate is prepped in a whirler, where a gum arabic and green pigment formulation is applied. Next, the plates are developed using a solution containing copper, aluminum, isopropyl alcohol, and butyl cellusol. The plates are rinsed as a final step. The facility also has film processing capabilities via two film processors.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated in the plate preparation process during the rinsing step. The remaining portion of the total discharge is from sanitary usage and from the two film processors. The only pretreatment prior to discharge is a trap that provides for settling of solids after the whirler unit.

Results--

Sampling consisted of two grab samples collected and composited on two days, October 21 and 22. The sampling site was a manhole inside the plant (M-11) which does not include the sanitary and film processing wastewaters.

The flow (6,179 gpd) was determined from MLG&W water meter readings spaced 24 hours apart, minus that portion of water attributed to sanitary waste (540 gpd). Subsequent loadings reported in the attached table were based on a daily wastewater flow of 5,639 gpd. Company records indicated that the monthly water usage, during the past three months, varied from 12,700-21,100 cubic feet with an average of 16,433 cubic feet. This equates to an average daily water usage of 5,717 gpd. Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXV.

The plant discharged 31, 19, and 2 percent of the total zinc, chrome, and copper discharged into the WTP. Heavy metals are not specifically treatable by biological treatment processes.

### TABLE XXV
### ANALYTICAL RESULTS AND WASTEWATER LOADINGS
### DIXIE LITHO PLATE
### MEMPHIS, TN
### OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 0.006 | | | 6841 | 129000 | 276000 |
| M11 | | | 761022 | 1105 | | 27.0 | 2.0 | | | |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 0.006 | | | 6048 | 70600 | 960000 |

| STATION | DATE | TIME | DATE | TIME | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SILVER AG,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 24900 | 310 | 250 | 10< | 20< |
| M11 | | | 761022 | 1105 | | | | | |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 12820 | 500 | 206 | 19 | 29 |

*********************************************** LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 0.006 | 322 | 6 | 13 | 1 |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 0.006 | 285 | 3 | 45 | 1 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SILVER AG,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 0.006 | 0 | 0 | 0 | 0 |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 0.006 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 0.006 | 146 | 3 | 6 | 1 |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 0.006 | 129 | 2 | 20 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SILVER AG,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M11 | 761021 | 1210 | (C)761021 | 1615 | 0.006 | 0 | 0 | 0 | 0 |
| M11 | 761022 | 1105 | (C)761022 | 1420 | 0.006 | 0 | 0 | 0 | 0 |

NOTE: LOADS REPORTED ABOVE WERE CALCULATED FROM THE CONCENTRATION OF TWO GRABS COMPOSITED DAILY USED IN CONJUNCTION WITH AVERAGE DAILY FLOW.

## Alco Gravure, Incorporated--

### Introduction--

Alco Gravure is a commercial printer located at 828 East Holmes Road. Approximately 172 people are employed in a two phase operation, printing and photo-engraving. The printing operation is a seven day per week, 24-hour per day operation. The photo-engraving operation is a five day per week, 14-hour per day operation.

Photo-engraving consists of copper plating and polishing, film developing, etching and chrome plating of cylindrical printing plates. The printing phase consists of inking and roll-pressing the printing plates for transference of impressions to paper.

### Wastewater Discharges and Pretreatment Processes--

The only significant wastewater generation was in the photo-engraving department. Excluding any spillage, wastewaters originate from a series of okite (cleaning solution) tanks and clear water rinse tanks. Okite tanks provide preparatory cleaning to plating; rinse tanks provide cleansing after each plating and etching operation.

Pretreatment of these wastewaters is provided by a dual underflow-overflow system which provides clarification by trapping the floatables and settling the solids. The tank is pumped out periodically by a septic tank service. Ultimate disposal of this sludge by the septic tank service is unknown.

Sanitary wastes and cooling waters are on a separate line which discharges directly into the sewerage system.

Results--

On two consecutive days, October 21 and 22, 1976, 14-hour composite samples were collected at half-hour intervals from the tank cleanout (M-12). Tank wastewater flow was determined by daily MLG&W water meter readings minus sanitary and boiler water consumption. Subsequent loadings given in the attached table were determined from the composite parameter concentrations and total calculated flow during the production period.

Company records indicate an average monthly water usage of 51,800 cubic feet, based on the last two months. This equates to an approximate daily usage of 18,020 gpd, based on a five-day work week. Raw water usage on October 20 through 21 and October 21 through 22, was 19,410 and 23,255 gpd, respectively. Wastewater discharge flows, with the subsequent uses subtracted, were 5,022 gpd and 8,867 gpd, respectively. These figures were used in the loading calculations. Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXVI.

This facility discharges more than one percent of the total chromium and copper load to the plant and was considered to be a major contribution to the sewerage system. Biological treatment processes, such as those employed at the WTP, are not specifically designed to remove heavy metals.

## TABLE XXVI
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ALCO GRAVURE INC.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 0.005 | | | 2500.0 | 340 | 6209 | |
| M12 | | | 761021 | | | 18.0 | 2.5 | | | | |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 0.009 | | | | | | 5.00< |
| M12 | | | 761022 | 1130 | | | | 2000.0 | 270 | 6169 | 5.00< |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | IRON FE,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 2020 | 1045 | 11300 | 385 | 201500 | 539 | 10< |
| M12 | | | 761021 | | | | | | | | |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 5900 | 850 | 8320 | 534 | 133600 | 244 | 10< |
| M12 | | | 761022 | 1130 | | | | | | | |

************************************************** LOADINGS **************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 0.005 | 104.7 | 14 | 260 | 0.29* | 0 | 0 |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 0.009 | 148.0 | 20 | 457 | | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | IRON FE,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 0.005 | 0 | 0 | 8 | 0 | 0 |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 0.009 | 1 | 0 | 10 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 0.005 | 47.5 | 6 | 118 | | 0 | 0 |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 0.009 | 67.2 | 9 | 207 | | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | IRON FE,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M12 | 761020 | 0835 | (C)761020 | 2200 | 0.005 | 0 | 0 | 4 | 0 | 0< |
| M12 | 761021 | 0900 | (C)761021 | 2400 | 0.009 | 0 | 0 | 4 | 0 | 0< |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Quality Industrial Uniform Service--

Introduction--

Quality Industrial Uniform Service, located at 2868 Rudder, is an industrial laundry which employs 66 people seven hours per day, five days per week. The process is a wet cleaning (no dry cleaning) operation.

Wastewater Discharges and Pretreatment Processes--

Wastewaters originate from the washing operation and also contain cooling waters. Sanitary wastes are discharged separately. Pretreatment consists of bar screens and a small settling basin.

Results--

Grab samples were taken from the effluent sump (M-14) twice per day and composited daily during October 19 and 20, 1976. Flow was determined from MLG&W water meter readings with an adjustment made for sanitary wastewaters. Adjusted flows during the sampling periods of October 19 and 20, 1976 were 40,238 gpd and 39,265 gpd, respectively. Company records for the previous three months revealed an average monthly water usage of 152,400 cu. ft. (53,033 gpd). Wastewater discharge loads given in Table XXVII are considered slightly less than normal for this facility.

The $BOD_5$, TSS, COD, and oil and grease concentrations of this facility's wastewater were well above those of typical domestic wastewaters. Oil and grease loadings from this facility constituted greater than four percent of the WTP influent waste load.

TABLE XXVII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
QUALITY INDUSTRIAL UNIFORM
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M14 | | | 761019 | 1100 | 0.040 | 34.0 | 10.7 | 350.0 | 310 | 2.150 | 1174 | |
| M14 | | | 761019 | 1500 | | 31.0 | 7.1 | | | | | 99.00 |
| M14 | | | 761020 | 1140 | 0.039 | 50.0 | | 558.0 | 730 | 2.400 | 3790 | |
| M14 | | | 761020 | 1545 | | 35.5 | 10.9 | | | | | 3002.00 |

**************************************************** LOADINGS ****************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M14 | | | 761019 | 1100 | 0.040 | 117.4 | 104 | 0.721 | 394 | |
| M14 | | | 761020 | 1140 | 0.039 | 183.0 | 239 | 0.787 | 1243 | 514 * |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M14 | | | 761019 | 1100 | 0.040 | 53.3 | 47 | 0.327 | 179 | |
| M14 | | | 761020 | 1140 | 0.039 | 83.0 | 109 | 0.357 | 564 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

### Valley Products Company--

### Introduction--

Valley Products is an industrial soap manufacturer located at 384 East Brooks Road. The facility employs 30 people in a three day per week, two shift operation. The basic saponification is used to hydrolyze vegetable oil with caustic soda to produce soap. The finished soap goes through a chilling roll or is spray dried.

### Wastewater Discharges and Pretreatment Processes--

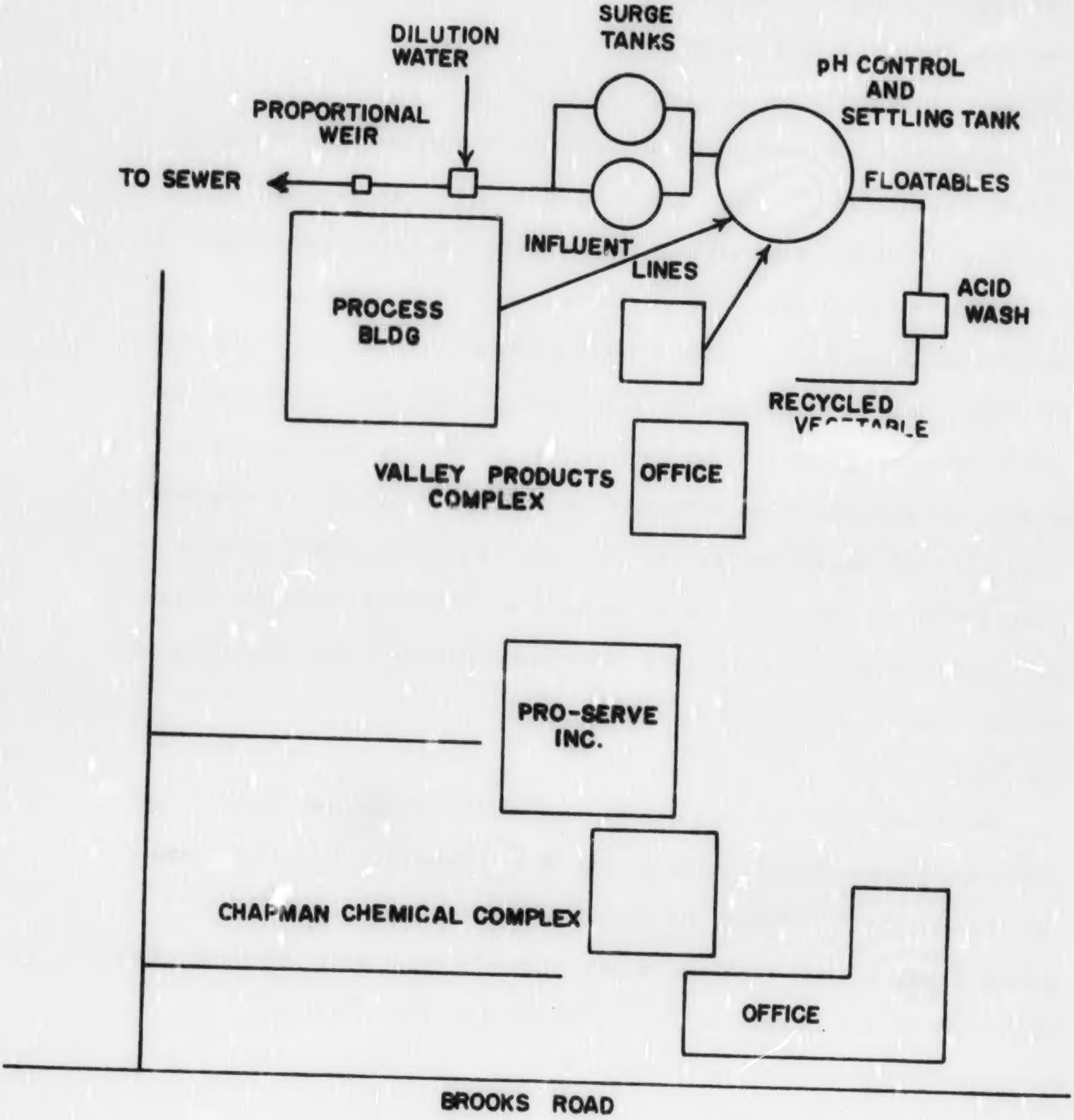
Wastewaters are generated when water is extracted from the highly organic raw material, during cleanup and during process operations.

Caustic process wastewaters are pumped into a common tank (Figure 8). Wastewater is neutralized with sulphuric acid to a pH range of 6.5 - 7.0 and allowed to settle. Floatable fatty acids are skimmed off, acid washed, and pumped back to the plant for reprocessing. Through a series of taps (at 2' vertical increments) on the settling tanks, the layer of liquid between the floatables and solids is determined. This wastewater supernatant is then pumped into one of two surge tanks, the flow from which is throttled by the use of valves to maintain a continuous 15-20 gpm release. The cooling water line discharges downstream from this line, providing dilution prior to the proportional weir.

### Results--

Wastewater from the surge tanks was sampled in the open channel just upstream of the company's proportional weir. This site (M-15) was sampled for two consecutive 24-hour periods at 15 minute intervals. Flow was determined from daily readings of the company's totalizer. Discharge flows on October 19 and 20 were 45,050 and 53,500 gpd, respectively.

## FIGURE 8
## SITE DIAGRAM
## VALLEY PRODUCTS CO.
## MEMPHIS, TENNESSEE


SURGE TANKS
DILUTION WATER
pH CONTROL AND SETTLING TANK
PROPORTIONAL WEIR
TO SEWER
FLOATABLES
INFLUENT LINES
ACID WASH
PROCESS BLDG
RECYCLED VEGETABLE
VALLEY PRODUCTS COMPLEX
OFFICE
PRO-SERVE INC.
CHAPMAN CHEMICAL COMPLEX
OFFICE
BROOKS ROAD

Loads in Table XXVIII were based on the composite parameter concentrations and daily flows determined with the company totalizer. Operation during the sampling period was considered normal by company personnel. This effluent accounted for nearly six percent of the $BOD_5$ and COD, 18 percent of the TSS, and three percent of the oil and grease discharged during the study. In addition, significant concentrations of sulfates were measured, ranging from 5,550 to 10,500 mg/1.

TABLE XXVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
VALLEY PRODUCTS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L | SULFATE SO4-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M15 | 761018 | 1540 | (C)761019 | 1415 | 0.045 |  |  | 16330.0 | 2925 | 26830 |  | 10500 |
| M15 |  |  | 761019 | 1454 |  | 38.0 | 5.5 |  |  |  | 960.00 |  |
| M15 | 761019 | 1500 | (C)761020 | 1500 | 0.053 |  |  | 7330.0 | 1730 | 15850 |  | 5550 |
| M15 |  |  | 761020 | 1505 |  | 35.0 | 6.0 |  |  |  | 784.00 |  |

LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | SULFATE SO4-TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M15 | 761018 | 1540 | (C)761019 | 1415 | 0.045 | 6139.4 | 1100 | 10087 | 356* | 3948 |
| M15 | 761019 | 1500 | (C)761020 | 1500 | 0.053 | 3272.6 | 772 | 7077 |  | 2478 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | SULFATE SO4-TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M15 | 761018 | 1540 | (C)761019 | 1415 | 0.045 | 2784.8 | 499 | 4575 | 163.71 | 1791 |
| M15 | 761019 | 1500 | (C)761020 | 1500 | 0.053 | 1484.4 | 350 | 3210 |  | 1124 |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

### Chapman Chemical Company--

#### Introduction--

Chapman Chemical is a wood preservative manufacturer located at 416 East Brooks Road. They employ 48 people in a five day per week, eight hour per day operation.

This process consists of three production lines, one dry and two wet. The dry line operation is a mixing and packaging of true wood preservatives. The wet lines involve mixing, blending, and packaging pigmented wax emulsions, and blending and packaging sapstain control solutions. These solutions provide antimicrobial control of fungi. Active ingredients used in this process are: pentachlorophenol, tetrachlorophenol, copper-8 quinolinolate, and phenyl mercuric lactate.

#### Wastewater Discharges and Pretreatment Processes--

Mixing vessel washdowns from product changeovers and floor drainage generate the total industrial wastewater volume discharged into the sewerage system. Sanitary sewage is discharged from a separate line. Pretreatment consists of an underflow-overflow chamber that provides discrete separation of floatables and settleables, which are respectively skimmed and pumped off, both going to a common tank for ultimate disposal in a landfill.

#### Results--

Sampling consisted of composite samples collected at half-hour intervals for seven to eight hours of the production period on two consecutive days during October 18 through 20, 1976.

On the first day of sampling, only the Millbrite 50 product line was in operation. This product is a weather protectant solution for lumber and plywood. On the second day of sampling, only the Sealtite line was operating. This is a pigmented wax emulsion used as an end coating to control splitting and checking in wood products.

Flows were determined from daily readings of three separate water meters. The MLG&W meter totalized the entire raw water usage, while the other two devices metered specific in-plant usage. The two in-plant meter readings were subtracted from the MLG&W meter reading to give the total industrial water usage and thus the corresponding wastewater discharge. However, 24 gpm was detected as totalized use on the MLG&W meter during the time the system was inoperative. This usage was attributed to a leak in the air compressor chiller system. Resulting discharge flows (leak subtracted) used in the loading analysis, for the period of October 18 through 20 were 18,670 gpd and 7,780 gpd, respectively. Company records indicate that the average monthly usage was 133,600 cubic feet. This equates to a daily usage of 46,480 gpd; subtracting the leakage rate gives an average discharge flow rate of 11,920 gpd. According to company estimates of normal water usage in the processing of the Millbrite product, flow on that first day of sampling was unusually high, and thus this loading was not assumed to be indicative of normal operation. Analytical results are presented in Table XXIX.

During the period of the investigation, only the Sealtite and Millbrite product lines were in operation. Characterization of the wastewaters revealed the presence of benzene, xylene, and several alkyl benzenes. Benzene is on EPA's Consent Decree: "65 Toxic Chemicals List."

Heavy metals, COD, and TSS were not detected in significant concentrations. However, the results are only representative of these two product lines and should not be categorically accepted as typical for all the products manufactured at this facility.

TABLE XXIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CHAPMAN CHEMICAL
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 0.019 | | | 40 | 89 | 50< |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 0.008 | | | 22 | 53 | 50< |
| M16 | | | 761019 | 0918 | | 16.0 | 6.6 | | | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | MERCURY HG,TOTAL UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 82 | 22 | 85 | 3.5 | 20< | 10< |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 165 | 14 | 288 | 2.3 | 20< | 10< |
| M16 | | | 761019 | 0918 | | | | | | |

******************** LOADINGS ********************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 0.019 | 6 | 14 | 0 | 0 | 0 |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 0.008 | 1 | 3 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT LB/D | MERCURY HG,TOTAL LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 0.019 | 0 | 0.0 | 0 | 0 |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 0.008 | 0 | 0.0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 0.019 | 3 | 6 | 0 | 0 | 0 |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 0.008 | 1 | 2 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT KG/D | MERCURY HG,TOTAL KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M16 | 761018 | 0900 | (C)761019 | 0900 | 0.019 | 0 | 0.0 | 0 | 0 |
| M16 | 761019 | 0900 | (C)761020 | 0900 | 0.008 | 0 | 0.0 | 0 | 0 |

## Illinois Central Gulf Railroad - "Johnston Yard"--

### Introduction--

The Illinois Central Gulf Railroad Yard is located off Horn Lake Road between Alcy and Peebles Road. The company employs approximately 550 people in a seven day a week, 24-hour operation. This facility is engaged in the transfer of commercial freight, maintenance and refueling of train engines, plus the switching of railway cars.

### Wastewater Discharges and Pretreatment Processes--

The major source of wastewater is surface runoff from the yard apron which drains the maintenance and refueling depot. Wastewaters are pretreated in two series-operated lagoons. Both lagoons are equipped with oil flotation collars; the upstream lagoon has two oil mop apparatuses (Figure 9).

### Results--

The facility was sampled just downstream of the company's rectangular weir at Site M-17 (Figure 9) for two consecutive 24-hour compositing periods using a 15-minute sampling interval. Flow was determined by daily readings of the company's totalizer. A comparison of instantaneous measurements made on the company's rectangular weir and 12-inch Parshall flume showed the separate primary devices to be closely correlated. Effluent flows used to compute subsequent loadings for the period October 19 through 20 and October 20 through 21 were 258,000 and 156,000 gpd, respectively.

Operation during the sampling period was considered normal by company personnel. Wastewater discharge loads are given in Table XXX. This facility is a minor discharger that contributes a wastewater amenable to treatment by the contact stabilization process used at the WTP.

# FIGURE 9
# TREATMENT SYSTEM
# ILLINOIS CENTRAL GULF RR
# MEMPHIS, TENNESSEE

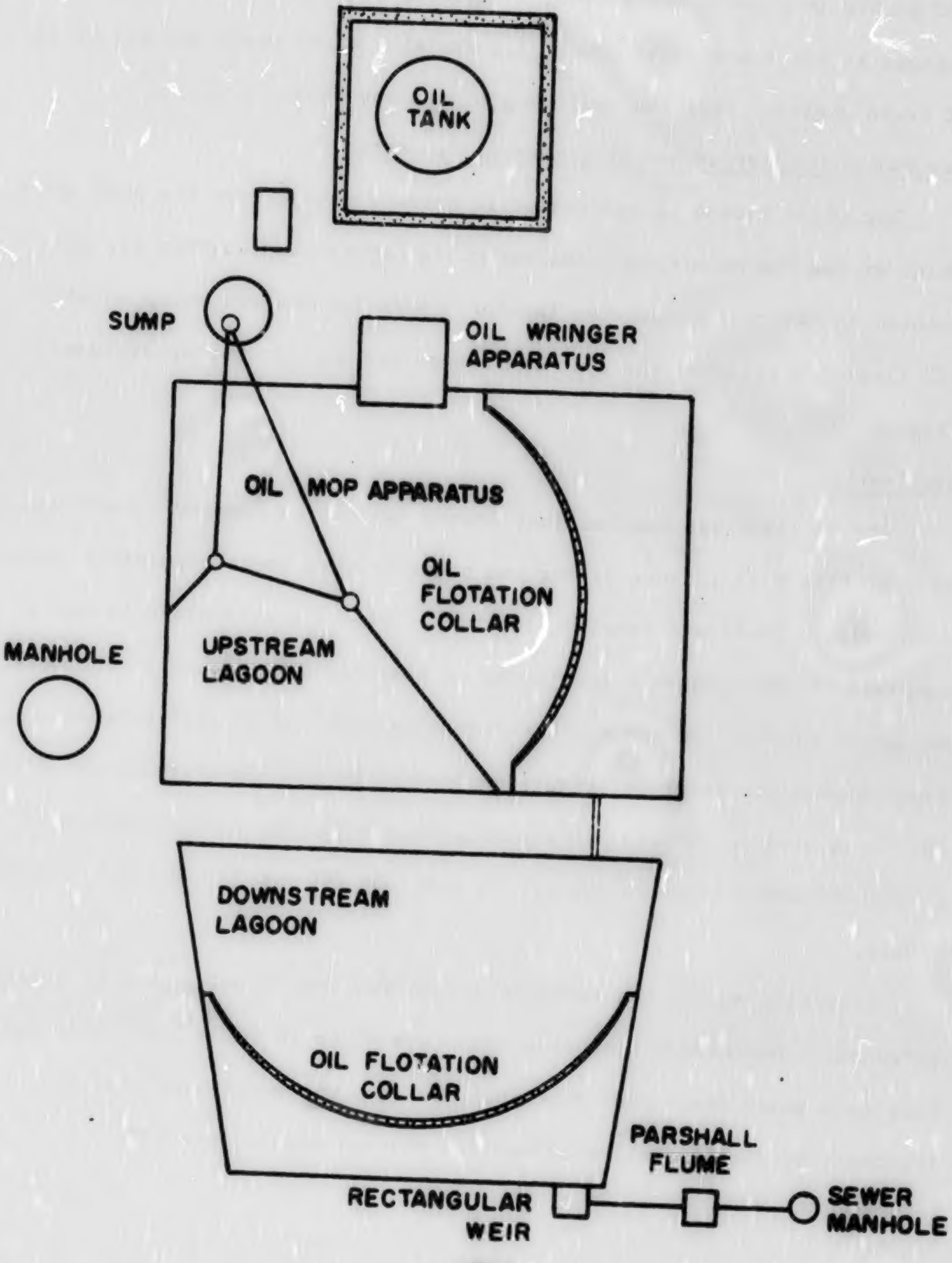

OIL TANK
SUMP
OIL WRINGER APPARATUS
OIL MOP APPARATUS
OIL FLOTATION COLLAR
MANHOLE
UPSTREAM LAGOON
DOWNSTREAM LAGOON
OIL FLOTATION COLLAR
PARSHALL FLUME
RECTANGULAR WEIR
SEWER MANHOLE

TABLE XXX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ILLINOIS CENTRAL RR
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | PHENOLS TOTAL UG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M17 | 761019 | 1315 | (C)761020 | 1315 | 0.258 | | | 20.0< | | 40 | 85 | |
| M17 | 761020 | 1310 | (C)761021 | 1410 | 0.156 | | | 20.0< | | 58 | 40 | |
| M17 | | | 761020 | 1316 | | 18.0 | 9.1 | | | | | |
| M17 | | | 761020 | 1317 | | | | | 95 | | | 8.80 |
| M17 | | | 761021 | 1415 | | 18.0 | 9.1 | | 52 | | | 7.40 |

****************************************************** LOADINGS ******************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | PHENOLS TOTAL LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M17 | 761019 | 1315 | (C)761020 | 1315 | 0.258 | 43.1< | | 86 | 183 | |
| M17 | 761020 | 1310 | (C)761021 | 1410 | 0.156 | 26.0< | | 76 | 52 | 14 * |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | PHENOLS TOTAL KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M17 | 761019 | 1315 | (C)761020 | 1315 | 0.258 | 19.5< | | 39 | 83 | |
| M17 | 761020 | 1310 | (C)761021 | 1410 | 0.156 | 11.8< | | 34 | 24 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

### Rainbo Photo Service, Incorporated--

### Introduction--

Rainbo Photo Service is a wholesale photo finisher, located at 3061 Millbranch. The facility employs 40 people in a five and one-half day per week, 16-hour per day operation. Eight machines, four paper processing and four film developing, provide the operational capabilities in this photo finishing business.

### Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated from a continuous wash and rinse overflow of the eight processing units. These wastes are combined with the sanitary waste prior to discharge. Pretreatment consists of a silver recovery unit, which replates spent silver from the processing operation, and a sump that provides settling for all plant wastewater flow prior to discharge into the sewerage system.

### Results--

Two composite samples were collected from the company sump (M-19) for two consecutive days during the period of October 19 through 21, 1976. Samples were collected at 15-minute intervals for 15-16 hours of the production period. The flow of 12,878 gpd used in the loading computation was determined from MLG&W water meter readings spanning 24 hours.

Company estimates of process wastewater were 180 gallons per machine hour. Based on an estimation of 64 machine-hours per day, the total wastewater flow was 11,520 gpd. The sanitary contribution was 1,200 gpd; therefore, the total estimated flow was 12,720 gpd.

Operation during the sampling period was considered normal by company personnel, and loadings reported in Table XXXI were considered indicative of typical plant operations.

The characteristics of the wastewater from this facility are generally compatible with the contact stabilization process used at the WTP.

TABLE XXXI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
RAINBO PHOTO SERVICE
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | 0.013 | | | 370.0 | 3 | 559 | |
| M19 | | | 761020 | 0830 | | 21.0 | 7.1 | | | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 0.013 | | | | 1< | 447 | 50< |
| M19 | | | 761021 | 1105 | | 22.0 | 7.2 | | | | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SILVER AG,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | | | | | | |
| M19 | | | 761020 | 0830 | | | | | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 123 | 90 | 80< | 20< | 10 | 1620 |
| M19 | | | 761021 | 1105 | | | | | | |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | 0.013 | 39.8 | 0 | 60 | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 0.013 | | 0 | 48 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SILVER AG,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | 0.013 | | | | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 0.013 | 0 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | 0.013 | 18.0 | 0 | 27 | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 0.013 | | 0 | 22 | 0< | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SILVER AG,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M19 | 761019 | 0830 | (C)761020 | 0830 | 0.013 | | | | | |
| M19 | 761020 | 0830 | (C)761021 | 1100 | 0.013 | 0 | 0 | 0 | 0 | 0 |

### Richards Manufacturing Company--

#### Introduction--

Richards Manufacturing Company is a surgical implant and instrument manufacturer located at 1450 Brooks Road. The facility employs 385 people in a five day per week, two shift per day operation. The process consists of forming, polishing, and chemically finishing 300 and 400-series stainless steel to produce surgical implants and instruments.

#### Wastewater Discharges and Pretreatment Processes--

Continuous cooling water discharge from a parts coating oven operation, boiler blowdown water, sanitary usage, and rinse water from the electro-plating operation account for the total wastewater discharge into the sewer system. There is no pretreatment of this combined industrial and sanitary discharge.

#### Results--

Sampling consisted of two grab samples taken and composited on two consecutive days, October 21 and 22, 1976. The sampling site (M-20) was a street manhole located at the northeast corner of the plant. Each individual grab sample at this location was a composite of two samples, one from each of the two discharge pipes that convey the total plant discharge into the manhole.

Flow was determined from MLG&W water meter readings over the sampling period. Subsequent loadings using this flow (42,000 gpd) are given in Table XXXII.

Company records indicate that the monthly water usage during the past four months averaged 116,825 cf. This equates to an average daily water usage of 41,000 gpd. Operation during the study was considered typical, and thus the discharges are assumed to be representative of typical discharges.

Characteristics of the wastewater from this facility during the study period were compatible with the contact stabilization process used at the WTP. However, the results should not be categorically accepted as typical of the wastewater discharged from this facility at all times.

## TABLE XXXII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
## RICHARDS MANUFACTURING
## MEMPHIS, TN
## OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 0.042 | | | 40.0< | 62 | 41 | |
| M20 | | | 761022 | 1050 | | 25.0 | 8.3 | | | | 14.00 |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 0.042 | | | 200.0< | 76 | 162 | |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 211 | 128 | 348 | 80< | 80 | 10< |
| M20 | | | 761022 | 1050 | | | | | | |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 148 | 138 | 400 | 80< | 69 | 10< |

****************************************** LOADINGS ******************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CHROMIUM CR,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 0.042 | 14.0< | 22 | 14 | 4.9* | 0 |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 0.042 | 70.1< | 27 | 57 | | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 0.042 | 0 | 0 | 0 | 0 | 0 |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 0.042 | 0 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CHROMIUM CR,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 0.042 | 6.4< | 10 | 7 | | 0 |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 0.042 | 31.8< | 12 | 26 | | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M20 | 761021 | 1145 | (C)761021 | 1540 | 0.042 | 0 | 0 | 0 | 0 | 0 |
| M20 | 761022 | 1050 | (C)761022 | 1440 | 0.042 | 0 | 0 | 0 | 0 | 0 |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

NOTE: ALL OTHER LOADS REPORTED WERE CALCULATED FROM THE AVERAGE OF TWO DAILY GRABS (COMPOSITED) AND AVERAGE DAILY FLOW

National Starch and Chemical Corporation--

## Introduction

National Starch and Chemical Corporation, located at 4035 Senator Street, produces synthetic adhesives. The facility operates eight hours per day, five days per week, and employs eight people. Using a blending and heating batch process, two categories of adhesives are produced (i.e., Polyvinyl Acetate and Dextren). Chemicals used in the Polyvinyl Acetate adhesives are Dibutyl thiolate, trichloroethylene, formaldehyde, phenols, and defoaming agents. Chemical ingredients used in the formulation of Dextren adhesives are corn starch, borax, caustic soda, and formaldehyde.

## Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from mixing vat cleanups, floor washings, and cooling water flows which discharge untreated through a common drain. Sanitary wastes are not combined with the process wastewaters.

## Results--

Three consecutive daily composites were taken from the effluent drain (M-21) during the period of October 19 through October 21, 1976. Samples were taken at half-hour intervals for 6-7 hours of the production period. Flows were determined by an EPA-installed 60° V-notch weir and stage recorder. Subsequent loadings are given in Table XXXIII, and were determined from the composite parameter concentrations and total flow during the production period.

Company records indicate an average monthly water usage of 118,533 cf based upon the last three months ending October 15, 1976. This equates to a daily usage of 41,240 gallons per day. Discharge flows were in the range of 16,000-25,000 gallons for an 8.5 hour production period. The balance of the water usage is attributed to sanitary waste discharges to the city sewer and to cooling water discharge during non-production periods. Company personnel considered operations normal during the study period.

Although this plant discharges a small volume of wastewater, seven organic compounds, four of which are on EPA's Consent Decree: "65 Toxic Chemicals List," were isolated in samples from the discharge.

## TABLE XXXIII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
## NATIONAL STARCH AND CHEMICAL
## MEMPHIS, TN
## OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M21 | | | 761019 | 0930 | | | | | | | 225.00 |
| M21 | 761019 | 1000 | (C)761019 | 1730 | 0.025 | | | 666.0< | 1080 | 4234 | |
| M21 | | | 761020 | 1100 | | 25.0 | | | | | |
| M21 | 761020 | 1100 | (C)761020 | 1730 | 0.024 | | | 799.0 | 1255 | 3982 | |
| M21 | 761021 | 1100 | (C)761021 | 1700 | 0.016 | | | 640.0 | 85 | 605 | |
| M21 | | | 761021 | 1110 | | 31.0 | 6.4 | | | | |

******************** LOADINGS ********************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M21 | 761019 | 1000 | (C)761019 | 1730 | 0.025 | 138.4< | 224 | 880 | |
| M21 | 761020 | 1100 | (C)761020 | 1730 | 0.024 | 162.0 | 255 | 808 | 40.9 * |
| M21 | 761021 | 1100 | (C)761021 | 1700 | 0.016 | 86.5 | 11 | 82 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M21 | 761019 | 1000 | (C)761019 | 1730 | 0.025 | 62.8< | 102 | 399 | |
| M21 | 761020 | 1100 | (C)761020 | 1730 | 0.024 | 73.5 | 115 | 366 | |
| M21 | 761021 | 1100 | (C)761021 | 1700 | 0.016 | 39.2 | 5 | 37 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG DAILY FLOW)

### Utrex, Incorporated--

#### Introduction--

Utrex, located at 3820 Delp, is an industrial laundering operation which employs 30 people working eight hours per day on a five day per week work schedule. Industrial uniforms, rags, and shop towels are laundered by both dry cleaning and wet cleaning processes. In this relatively unique process, oil stained materials are solvent cleaned (dry cleaned) and then receive standard wet cleaning.

#### Wastewater Discharges and Pretreatment Processes--

Process wastewaters include laundry water, cooling water, and dry cleaning solvent carryover and spillage. Sanitary wastes are discharged separately. Pretreatment consists of bar screens and a settling basin. Settled solids are removed by a septic tank service company.

#### Results--

A single grab sample was taken on October 19 at a location prior to pretreatment. On October 20, two grab samples were composited from the sump (M-22) following pretreatment. In addition, on October 20, a sample (M-22A) was taken from spent solvent found floating on the final settling basin. Flow was determined from MLG&W water consumption adjusted for sanitary waste. Company records for the last three months indicate an average water usage of 105,800 cf (36,800 gpd). During the sampling period of October 19 and 20, process wastewater flows to the sewer were 32,860 gpd and 26,400 gpd, respectively, based upon water meter readings minus sanitary waste. Wastewater discharge loads with the exception of M-22A given in Table XXXIV are considered typical for this facility.

Wastewaters discharged from this facility are compatible with the contact stabilization process at the WTP. Loadings constitute less than one percent of the total loadings to the WTP.

Spilled dry cleaning fluid (COD of 242,000 mg/l), found floating in the company's settling basin, constitutes a significant potential load to the WTP. The company had the fluid (1,800 gallons) removed by a cleanout service during the study period. The ultimate disposal location of this fluid by the cleanout service is unknown.

# TABLE XXXIV
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UTREX
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M22 | | | 761019 | 1100 | 0.033 | 64.0 | 9.9 | 93.0 | 75 | 4.600 | 360 | 45.00 |
| M22 | 761020 | 1100 | (C)761020 | 1300 | 0.027 | | | 90.0 | 60 | 1.500 | 283 | 132.00 |

************************** LOADINGS **************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M22 | | | 761019 | 1100 | 0.033 | 25.5 | 21 | 1.263 | 101 | 21.88* |
| M22 | 761020 | 1100 | (C)761020 | 1300 | 0.027 | 20.2 | 13 | 0.337 | 64 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M22 | | | 761019 | 1100 | 0.033 | 11.6 | 9 | 0.573 | 46 | |
| M22 | 761020 | 1100 | (C)761020 | 1300 | 0.027 | 9.2 | 6 | 0.153 | 29 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|
| M22A | | | 761020 | 1000 | 0.002 | 242000 |

************************** LOADINGS **************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|
| M22A | | | 761020 | 1000 | 0.002 | 3635 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|
| M22A | | | 761020 | 1000 | 0.002 | 1649 |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Cleo Wrap Corporation--

Introduction--

Cleo Wrap Corporation, located at 4025 Viscount, manufactures wrapping paper, with 1250 employees. The plant operates five days per week on three eight-hour shifts. In the manufacturing process, paper stock is converted to wrapping paper by the passage over various color-impregnating cylinders and over electro-plating cylinders. The primary metals employed in the plating process are chrome, hexavalent chrome and copper.

Wastewater Discharges and Pretreatment Processes--

Cooling waters and sanitary wastes are discharged directly into the city sewer. Production wastes emanate from acid stripping of the printing cylinders and are pretreated with sodium bisulfate (to convert $Cr^6$ to $Cr^3$) and sodium hydroxide (to neutralize). Pretreatment occurs in a two stage batch process with sedimentation, Cr reduction, and neutralization in the first stage, and final neutralization adjustment in the final stage prior to discharge. Solids from the pretreatment process are removed by a solid waste disposal company and ultimately incinerated.

Results--

Sampling consisted of two grab samples taken from the final sump (M-26) and composited on October 19; a single grab was taken on October 20. The batch system is discharged to the city sewer once per production day with a flow (reported by the company) of 160-196 gallons. Results given on Table XXXV are based on a flow of 178 gallons per production day.

Company personnel considered the operation normal during the sampling period.

Even though the wastewater flow was only 180 gallons/day, chromium and zinc discharge to the WTP represented 8.7 and 0.5 percent of the total loadings of these parameters discharged to the WTP during the study. In addition, the wastewater is batch-discharged once per day. Biological treatment processes are not specifically designed to remove heavy metals from wastewater.

## TABLE XXXV
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CLEO WRAP CORP.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L | CYANIDE CN-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | | | | 761019 | 1300 | | 22.0 | 11.0 | | | | |
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 0.00018 | | | 3590 | 2744 | 42.00 | 1.400 |
| M26 | | | | 761020 | 1100 | 0.00018 | | | 5940 | 3049 | 8.00 | 1.210 |
| M26 | | | | 761021 | 1000 | 0.00018 | | | 5300 | 2845 | 37.00 | 0.600 |

| STATION | DATE | TIME | | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | | | | 761019 | 1300 | | | | | | |
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 1025000 | 251000 | 7820 | 24300 | 239 | 50 |
| M26 | | | | 761020 | 1100 | 1767000 | 420000 | 13980 | 35700 | 271 | 55 |
| M26 | | | | 761021 | 1000 | 1398000 | 321000 | 11160 | 29400 | 240 | 45 |

****************************************************** LOADINGS ******************************************************

| STATION | DATE | TIME | | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CYANIDE CN-TOT LB/D | CHROMIUM CR,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 0.00018 | 5 | 4 | 0.06 | 0.002 | 2 |
| M26 | | | | 761020 | 1100 | 0.00018 | 9 | 5 | 0.01 | 0.002 | 3 |
| M26 | | | | 761021 | 1000 | 0.00018 | 8 | 4 | 0.06 | 0.001 | 2 |

| STATION | DATE | TIME | | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 0.00018 | 0 | 0 | 0 | 0 | 0 |
| M26 | | | | 761020 | 1100 | 0.00018 | 1 | 0 | 0 | 0 | 0 |
| M26 | | | | 761021 | 1000 | 0.00018 | 0 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CYANIDE CN-TOT KG/D | CHROMIUM CR,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 0.00018 | 2 | 2 | 0.03 | 0.001 | 1 |
| M26 | | | | 761020 | 1100 | 0.00018 | 4 | 2 | 0.01 | 0.001 | 1 |
| M26 | | | | 761021 | 1000 | 0.00018 | 4 | 2 | 0.03 | 0.000 | 1 |

| STATION | DATE | TIME | | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M26 | 761019 | 1300 | (C) | 761019 | 1520 | 0.00018 | 0 | 0 | 0 | 0 | 0 |
| M26 | | | | 761020 | 1100 | 0.00018 | 0 | 0 | 0 | 0 | 0 |
| M26 | | | | 761021 | 1000 | 0.00018 | 0 | 0 | 0 | 0 | 0 |

D&W Plating Company--

Introduction--

D&W Plating Company, located at 3855 Old Getwell Road, operates a plating operation with a staff of 25 people working five days per week with one eight-hour shift per day. Following a process of caustic rinsing, acid cleaning and electro-plating, seven process lines are used for standard zinc, chrome, and nickel plating.

Wastewater Discharges and Pretreatment Processes--

All wastewaters, including process, sanitary and cooling waters, are discharged untreated through a single in-plant sewerage system. Process wastewater flows originate from the rinse tank's continuous overflow and from plating solution overflow.

Results--

Three 6-7 hour composite samples were collected from the process effluent (M-27) on three consecutive days. Samples were collected at half-hour intervals with an automatic sampler. Flows were determined from daily MLG&W water usage and were 228,581, 205,573, and 255,083 gpd, respectively, for the three-day sampling period. Company records for the last three months reveal a usage of 694,833 cf/month (241,737 gpd). Company personnel considered operations typical during the sampling period. Wastewater discharge loads are given in Table XXXVI.

Chromium, zinc, copper, nickel, and cadmium loadings represent 14.7, 13.7, 0.4, 9.0, and 28.9 percent, respectively, of the total loadings into the plant. Additionally, the mean cyanide concentration in the discharge was 3.4 mg/1. Biological treatment processes are not specifically designed to remove either cyanide or heavy metals from wastewaters.

## TABLE XXXVI
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
D & W PLATING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | CYANIDE CN-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 0.229 | | | 46 | 3.500 | 40< | |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 0.206 | | | 24 | 1.650 | 40< | |
| M27 | | | 761019 | 1010 | | 19.0 | 6.5 | | | | 4.970 |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 0.255 | | | 24 | 1.400 | 40< | |
| M27 | | | 761020 | 1005 | | 19.0 | | | | | 3.450 |
| M27 | | | 761021 | 1040 | | 18.0 | 6.4 | | | | 1.870 |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 154 | 7875 | 41 | 80< | 469 | 476 |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 3600 | 6430 | 127 | 80< | 243 | 500 |
| M27 | | | 761019 | 1010 | | | | | | |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 1780 | 5400 | 49 | 80< | 418 | 378 |
| M27 | | | 761020 | 1005 | | | | | | |
| M27 | | | 761021 | 1040 | | | | | | |

****************************************************** LOADINGS ******************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | CYANIDE CN-TOT LB/D | CHROMIUM CR,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 0.229 | 88 | 6.677 | 76< | | 0 |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 0.206 | 41 | 2.831 | 69< | 6.6* | 6 |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 0.255 | 51 | 2.980 | 85< | | 4 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 0.229 | 15 | 0 | 0< | 1 | 1 |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 0.206 | 11 | 0 | 0< | 0 | 1 |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 0.255 | 11 | 0 | 0< | 1 | 1 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | CYANIDE CN-TOT KG/D | CHROMIUM CR,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 0.229 | 40 | 3.029 | 35< | | 0 |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 0.206 | 19 | 1.284 | 31< | | 3 |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 0.255 | 23 | 1.352 | 39< | | 2 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M27 | 761018 | 1100 | (C)761018 | 1700 | 0.229 | 7 | 0 | 0< | 0 | 0 |
| M27 | 761019 | 1000 | (C)761019 | 1700 | 0.206 | 5 | 0 | 0< | 0 | 0 |
| M27 | 761020 | 1000 | (C)761020 | 1700 | 0.255 | 5 | 0 | 0< | 0 | 0 |

* APPROXIMATION OF LOAD (CALCULATED WITH AVERAGE OF DAILY CONCENTRATIONS AND AVERAGE DAILY FLOW)

## Delta Foremost Chemical Corporation--

### Introduction--

Delta Foremost Chemical Corporation, located at 3915 Airpark, produces cleaning compounds with a staff of 60 people working five days per week with one eight hour shift per day. Both dry cleansers and liquid detergents are produced by blending processes at the facility. In the dry process, the primary ingredients are sodium silicate, phosphates, carbonates, caustic soda and borax. The liquid detergents blending operation includes the following chemicals: chlorinated methylene chloride, perchloroethylene, trichloroethylene, petroleum distillate, mineral oils, mineral spirits, toluene, and acetone.

### Wastewater Discharges and Pretreatment Processes--

Washdown wastes and cooling waters are the primary sources of process wastewaters. Sanitary wastes are discharged separately. The process wastewaters receive no pretreatment.

### Results--

One six to eight hour composite sample was taken each day from the process wastewater effluent at a cleanout tap (M-28) on October 18, 19, and 20. Samples were taken at half-hour intervals by means of an automatic sampler. Flow was determined by subtracting sanitary wastewater and product consumption from daily MLG&W water usage. Company records reveal a water usage of 21,667 cf/month (7,540 gpd) for the last three months. During the three day sampling period, water usage was 14,265, 10,779, and 7,854 gallons.

Operation during the sampling period was considered normal by company personnel. Wastewater discharge loadings are given in Table XXXVII.

Oil and grease and phenol loadings from this facility constituted nearly one percent of the loadings of these parameters into the WTP during the study. In addition, the volatile organic compounds used in the product, which are subject to enter the sewage system via spillage, are a potential problem in the WTP's contact stabilization process.

## TABLE XXXVII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
## DELTA FOREMOST CHEMICAL
## MEMPHIS, TN
## OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | PHENOLS TOTAL UG/L |
|---|---|---|---|---|---|---|---|---|---|
| M28 | 761018 | 1200 | (C)761018 | 1630 | 0.009 | | | 3300.0 | |
| M28 | | | 761019 | 0915 | | | | | 15500 |
| M28 | 761019 | 0930 | (C)761019 | 1700 | 0.007 | | | 5600.0 | |
| M28 | | | 761020 | 1015 | | 16.0 | | | 2505 |
| M28 | 761020 | 1030 | (C)761020 | 1700 | 0.005 | | | 3200.0 | |
| M28 | | | 761021 | 1400 | | | 9.5 | | 65000 |

| STATION | DATE | TIME | DATE | TIME | RESIDUE TOT NFLT MG/L | TOT KJEL N MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M28 | 761018 | 1200 | (C)761018 | 1630 | 216 | 9.55 | 515.000 | 7990 | |
| M28 | | | 761019 | 0915 | | | | | 1787.00 |
| M28 | 761019 | 0930 | (C)761019 | 1700 | 175 | 34.80 | 101.000 | 6150 | |
| M28 | | | 761020 | 1015 | | | | | 58.00 |
| M28 | 761020 | 1030 | (C)761020 | 1700 | 200 | 7.80 | 175.000 | 11060 | |
| M28 | | | 761021 | 1400 | | | | | 2376.00 |

******************************************************** LOADINGS ********************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | PHENOLS TOTAL LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSI FREON-GI LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M28 | 761018 | 1200 | (C)761018 | 1630 | 0.009 | 256.1 | 1.66* | 17 | 0.74 | 39.970 | 620 | 84.49* |
| M28 | 761019 | 0930 | (C)761019 | 1700 | 0.007 | 331.8 | | 10 | 2.06 | 5.984 | 364 | |
| M28 | 761020 | 1030 | (C)761020 | 1700 | 0.005 | 136.2 | | 9 | 0.33 | 7.448 | 471 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | PHENOLS TOTAL KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRS FREON-G KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M28 | 761018 | 1200 | (C)761018 | 1630 | 0.009 | 116.2 | | 8 | 0.34 | 18.130 | 281 | |
| M28 | 761019 | 0930 | (C)761019 | 1700 | 0.007 | 150.5 | | 5 | 0.94 | 2.714 | 165 | |
| M28 | 761020 | 1030 | (C)761020 | 1700 | 0.005 | 61.8 | | 4 | 0.15 | 3.378 | 214 | |

* APPROXIMATION OF LOADS (CALCULATED W/AVG OF DAILY CONCENTRATIONS [GRAB] AND AVG DAILY FLOW)

## J. M. Smucker Company--

### Introduction--

J. M. Smucker, located at 4740 Burbank, produces jams and preserves with a staff of 94 people who work one eight-hour production shift per day, five days per week.

The products are manufactured by blending preprocessed fruits, sugar, corn syrup, and natural pectin. The finished foodstuffs are then canned in glass jars through a pasteurizing system. The shift is split so that the period from approximately 7:00 a.m. to 3:30 p.m. is the production period and is followed by a cleanup period ending around 8:00 p.m.

### Wastewater Discharges and Pretreatment Processes--

Process and sanitary wastewaters pass through a screen and settling basin prior to discharge. Cooling waters are discharged through a separate sewer. Solids from the settling basin are removed by a solids disposal company.

### Results--

Samples were collected from the effluent sump (M-29) for three consecutive days by means of an automatic sampler. The sampler was programmed to take samples at half-hour intervals for periods of 10-12 hours per day. Flows were determined by subtracting metered cooling water usage from total MLG&W metered water consumption. Monthly water usage for the previous four months has averaged 552,850 cf (192,340 gpd). Water usage during the sampling period ranged from 172,000 to 215,000 gpd. When adjusted for cooling water diversion, the flow at the sampling point ranged from 145,000 to 186,000 gpd. Company personnel considered the operation normal during the sampling period. Wastewater discharge loads are given in Table XXXVIII.

The facility discharges major quantities of $BOD_5$ and COD which represent 0.8 and 1.1 percent, respectively, of the total loading of these parameters into the WTP.

# TABLE XXXVIII
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
J.M.SMUCKER
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M29 | 761018 | 1000 | (C)761018 | 2000 | 0.145 | | | | | | |
| M29 | | | 761019 | 0940 | | 24.0 | 6.5 | 932.0 | 140 | 5.100 | 2150 |
| M29 | 761019 | 1000 | (C)761019 | 2000 | 0.186 | | | | | | |
| M29 | | | 761020 | 0930 | | 23.0 | | 1932.0 | 180 | 4.150 | 3688 |
| M29 | 761020 | 0930 | (C)761020 | 2000 | 0.161 | | | | | | |
| M29 | | | 761021 | 1000 | | 23.0 | 6.8 | 600.0> | 14 | 6.000 | 2458 |

************************************************** LOADINGS **************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M29 | 761018 | 1000 | (C)761018 | 2000 | 0.145 | 1129.3 | 170 | 6.180 | 2605 |
| M29 | 761019 | 1000 | (C)761019 | 2000 | 0.186 | 3007.0 | 280 | 6.459 | 5740 |
| M29 | 761020 | 0930 | (C)761020 | 2000 | 0.161 | 808.7> | 19 | 8.087 | 3313 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M29 | 761018 | 1000 | (C)761018 | 2000 | 0.145 | 512.3 | 77 | 2.803 | 1182 |
| M29 | 761019 | 1000 | (C)761019 | 2000 | 0.186 | 1363.9 | 127 | 2.930 | 2604 |
| M29 | 761020 | 0930 | (C)761020 | 2000 | 0.161 | 366.8> | 9 | 3.668 | 1503 |

**Ralston Purina Company--**

Introduction--

Ralston Purina, located at 4272 Mendenhall, produces protein food fillers with an employment of 160 people. The facility is operated seven days per week with three eight-hour shifts per day.

Soy flakes (defatted soy bean) are converted to a powdered protein filler used for human consumption. The primary production units consist of extraction, clarification, washing, concentrating, and spray drying.

Wastewater Discharges and Pretreatment Processes--

Wastewaters from the production process are discharged untreated to the city sewer. Sanitary wastes are segregated from the production wastes. The company has installed a rectangular weir and totalizer at the production wastewater discharge point. In addition, by means of an automatic bucket type sampler, the company collects samples monthly for $BOD_5$ and TSS analysis. The following results were reported for the most recent five months:

| Date | $BOD_5$ (mg/l) | TSS (mg/l) | Flow (million gallons/mo.) |
|---|---|---|---|
| Apr | 1,700 | 984 | 27.86 |
| Jun | 2,250 | 1,362 | 22.48 |
| Jul | 1,733 | 1,311 | 23.75 |
| Aug | 1,621 | 1,033 | 23.41 |

Results--

Sampling consisted of three 24-hour composites collected from the effluent manhole (M-32) during October 18 through 21. These samples were collected by means of the company sampler, and similarly, flow was determined by the company flow device. The flow equipment was calibrated in October 1976. Wastewater discharge loads given in Table XXXIX are considered normal for the facility.

The facility contributed 10.7 percent of the $BOD_5$, 7.3 percent of the TSS, 13 percent of the COD, and 1.2 percent of the oil and grease discharged into the WTP. This plant is one of the most significant contributors of $BOD_5$ and TSS sampled during the study.

# TABLE XXXIX
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
RALSTON - PURINA
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M32 | 761018 | 0815 | (C)761019 | 0830 | 0.890 | | | 2000.0 | 1095 | 5386 | |
| M32 | | | 761019 | 0830 | | 33.0 | 10.4 | | | | 14.00 |
| M32 | 761019 | 0830 | (C)761020 | 0800 | 0.988 | | | 2600.0 | 1000 | 6403 | |
| M32 | 761020 | 0800 | (C)761021 | 0800 | 0.964 | | | 3800.0 | 1210 | 6403 | |
| M32 | | | 761020 | 0820 | | 37.0 | | | | | 31.00 |
| M32 | | | 761021 | 0820 | | 39.0 | 4.9 | | | | 11.00 |

****************************************************** LOADINGS ******************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M32 | 761018 | 0815 | (C)761019 | 0830 | 0.890 | 14854.6 | 8133 | 40004 | |
| M32 | 761019 | 0830 | (C)761020 | 0800 | 0.988 | 21441.7 | 8247 | 52804 | 147 * |
| M32 | 761020 | 0800 | (C)761021 | 0800 | 0.964 | 30570.5 | 9734 | 51511 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M32 | 761018 | 0815 | (C)761019 | 0830 | 0.890 | 6737.9 | 3689 | 18145 | |
| M32 | 761019 | 0830 | (C)761020 | 0800 | 0.988 | 9725.8 | 3741 | 23952 | |
| M32 | 761020 | 0800 | (C)761021 | 0800 | 0.964 | 13866.5 | 4415 | 23365 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

## Joseph Schlitz Brewing Company--

### Introduction--

Joseph Schlitz Brewing Company, located at 5151 East Raines, is a large scale brewing, bottling, and canning facility which produces approximately 5.3 million barrels per year of product. The company operates continuously five and one-half days per week with a work force of approximately 650 people. American Can Company is an integral part of the facility.

Through a typical brewing operation, barley, corn, and hops are converted to beer by the following unit operations: milling, cooking, fermenting, filtering, storage, and bottling or canning. Water is supplied by company wells.

### Wastewater Discharges and Pretreatment Processes--

Wastewaters emanate from nearly all of the above operations and are discharged to the sewerage system through a 9" Parshall flume. The flume and its accompanying totalizer is calibrated quarterly with the most recent calibration occurring in October 1976. The company collects daily samples of the discharge by means of a Chicago automatic sampler which is capable of taking flow proportioned samples. Company data for the months of August and September are as follows:

| Month | Total Flow (million gal/mo.) | $BOD_5$ (mg/l) Avg | TSS (mg/l) |
|---|---|---|---|
| Aug 76 | 73.7 | 1,600 | 530 |
| Sept 76 | 81.0 | 1,730 | 660 |

### Results--

Three consecutive 24-hour composite samples were collected from the effluent vault (M-33) during October 18 through October 21. Samples were collected by means of an EPA automatic sampler programmed to take samples at 15-minute intervals. Flows were determined by using the company's Parshall flume and totalizer. Flows during the three day sampling period were 2.45, 2.58, and 2.96 mgd. Wastewater discharge loads given in Table XL were considered normal for this facility.

This facility contributed 18.4 percent of the $BOD_5$, 16.4 percent of the TSS, 5.2 percent of the TKN, 5.1 percent of the total phosphorus, 16.4 percent of the COD, and 4.2 percent of the oil and grease which discharged into the WTP. This plant was the major industrial contributor of $BOD_5$ and TSS sampled during the study.

# TABLE XL
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
JOS SCHLITZ BREWING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M33 | 761018 | 0845 | (C)761019 | 0845 | 2.450 | | | | |
| M33 | | | 761019 | 0850 | | 28.0 | 6.1 | 1882.0 | 935 |
| M33 | 761019 | 0855 | (C)761020 | 0845 | 2.580 | | | | |
| M33 | | | 761020 | 0850 | | 25.0 | | 1932.0 | 910 |
| M33 | 761020 | 0850 | (C)761021 | 0850 | 2.960 | | | | |
| M33 | | | 761021 | 0900 | | 24.0 | 6.0 | 1432.0 | 810 |

| STATION | DATE | TIME | DATE | TIME | TOT KJEL N MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|
| M33 | 761018 | 0845 | (C)761019 | 0845 | 30.20 | 13.000 | 2766 | |
| M33 | | | 761019 | 0850 | | | | 20.00 |
| M33 | 761019 | 0855 | (C)761020 | 0845 | 28.50 | 13.800 | 3023 | |
| M33 | | | 761020 | 0850 | | | | 22.00 |
| M33 | 761020 | 0850 | (C)761021 | 0850 | | | 2408 | |
| M33 | | | 761021 | 0900 | | | | 26.00 |

**************************** LOADINGS ****************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M33 | 761018 | 0845 | (C)761019 | 0845 | 2.450 | 38479.3 | 19117 | 617.47 | 265.798 | 56554 | |
| M33 | 761019 | 0855 | (C)761020 | 0845 | 2.580 | 41597.6 | 19593 | 613.63 | 297.126 | 65088 | |
| M33 | 761020 | 0850 | (C)761021 | 0850 | 2.960 | 35373.3 | 20009 | | | 59483 | 502.85* |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M33 | 761018 | 0845 | (C)761019 | 0845 | 2.450 | 17453.9 | 8671 | 280.08 | 120.564 | 25652 | |
| M33 | 761019 | 0855 | (C)761020 | 0845 | 2.580 | 18868.4 | 8887 | 278.34 | 134.774 | 29523 | |
| M33 | 761020 | 0850 | (C)761021 | 0850 | 2.960 | 16045.1 | 9076 | | | 26981 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

Frito Lay, Inc.--

Introduction--

The facility, located at 2070 Airways Boulevard, manufactures potato and corn chips. Operation is continuous five days per week with 150 employees.

Potato chips are made by peeling, slicing, and frying raw potatoes in oil. Corn chips are made by cooking raw corn, washing, grinding, extruding, and frying.

Wastewater Discharges and Pretreatment Processes--

Wastewater results from potato cleaning, peeling and slicing, corn washing and kernel dehusking, and daily and weekly cleanup operations. About 15-20 percent of the city water supplied to the plant is lost in corn chip production. Process wastewater flows through a sump prior to discharging into the city sewage system. A septic tank service cleans the sump when required. Ultimate disposal of the sludge and skimmings is unknown. Sanitary sewage discharges to the sewerage system via a separate line.

Results--

Three consecutive 24-hour composite samples were collected at 30-minute intervals from the sump (M-38) during October 18 through 21, 1976. Effluent flows were determined by reading the MLG&W water meter and subtracting consumptive product loss (20 percent of water use) and sanitary uses.

Wastewater loadings (Table XLI) were determined from composite parameter concentrations and calculated flow during the sampling period. The most recent water bill from MLG&W showed the monthly use to be 5,610,000 gallons for a four week period. This equates to about 255,000 gallons per day based on 22 work days per month. Raw water used during the sampling period were 245,000 gallons, 256,000 gallons and 258,000 gallons for each of the three days. Company personnel indicated that production was about normal during the sampling period.

This discharger is a major contributor to the sewerage system. It accounts for almost 2 percent of the COD load and 3.5 percent of the total suspended solids discharged into the WTP. The $BOD_5$ contribution is about 0.6 percent. The TSS concentrations in the discharge (2500 mg/1) are roughly eight times that in domestic sewage; the COD concentrations (4050 mg/1) are about six times that of sewage; $BOD_5$ concentrations (720 mg/1) are approximately three times that of sewage.

# TABLE XLI
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
FRITOLAY
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M38 | | | 761018 | 1415 | | 24.0 | 9.4 | | | |
| M38 | 761018 | 1415 | (C)761019 | 1430 | 0.196 | | | 733.0 | 3380 | 4535 |
| M38 | | | 761019 | 1430 | | 23.0 | 5.7 | | | |
| M38 | 761020 | 1430 | (C)761021 | 1415 | 0.205 | | | 666.0< | 1780 | 3830 |
| M38 | | | 761021 | 1415 | | 21.0 | 6.9 | | | |
| M38 | 761021 | 1415 | (C)761022 | 1400 | 0.207 | | | 766.0 | 2280 | 3790 |

**************************************************** LOADINGS ****************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M38 | 761018 | 1415 | (C)761019 | 1430 | 0.196 | 1199.0 | 5529 | 7418 |
| M38 | 761020 | 1430 | (C)761021 | 1415 | 0.205 | 1139.4< | 3045 | 6552 |
| M38 | 761021 | 1415 | (C)761022 | 1400 | 0.207 | 1323.2 | 3939 | 6547 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M38 | 761018 | 1415 | (C)761019 | 1430 | 0.196 | 543.8 | 2508 | 3365 |
| M38 | 761020 | 1430 | (C)761021 | 1415 | 0.205 | 516.8< | 1381 | 2972 |
| M38 | 761021 | 1415 | (C)761022 | 1400 | 0.207 | 600.2 | 1787 | 2970 |

### General Cable Corp.--

#### Introduction--

The facility, located at 1278 Orgill Avenue, manufactures electrical building wire. Operation is continuous five days per week with 27 employees working each eight-hour shift (total employment of 81).

Raw materials used in the process are aluminum, copper, and plastic (PVC). The process consists of extruding and twisting the aluminum or copper and jacketing with PVC. After jacketing, the wire is spooled or boxed for shipping.

#### Wastewater Discharges and Pretreatment Processes--

Air compressor cooling water, contact cooling water and sanitary sewage are combined at a sump and discharged without pretreatment into the city sewer. Scum which accumulates in the sump is disposed of as trash.

#### Results--

Two consecutive 24-hour composite samples (30-minute collection interval) were obtained at the company sump (M-39) during October 19 through 21, 1976. Flows were determined by reading the MLG&W water meter. Since there are no consumptive losses, the raw water usage was assumed to be the effluent wastewater flow.

Wastewater loadings (Table XLII) were determined from composite parameter concentrations and the MLG&W water meter readings. The most recent water bill from MLG&W showed the monthly use to be 1.02 million gallons; i.e., 46,400 gallons per day based on twenty-two production days per month. Raw water readings for the sampling period were 57,000 and 51,000 gallons per day. Company personnel indicated that production was lower than normal but similar to recent months.

Since the flows are nearly representative of recent operating conditions, the wastewater discharge was assumed to be representative of existing conditions. The low pollutant concentrations and wastewater flows at this facility relegate it to a minor contributor status.

TABLE XLII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
GENERAL CABLE
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M39 | | | | 761019 1100 | | 25.0 | 6.6 | | | |
| M39 | 761019 | 1100 | (C)761020 | 1100 | 0.057 | | | 40< | | 50< |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 0.051 | | | 40< | | 50< |
| M39 | | | 761020 | 1115 | | 26.0 | | | 15.00 | |
| M39 | | | 761021 | 1030 | | 25.0 | 6.5 | | 12.00 | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | ALUMINUM AL,TOT UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M39 | | | 761019 | 1100 | | | | | | |
| M39 | 761019 | 1100 | (C)761020 | 1100 | 144 | 22 | 80< | 20< | 100< | 10< |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 136 | 20 | 80< | 20< | 100 | 10< |
| M39 | | | 761020 | 1115 | | | | | | |
| M39 | | | 761021 | 1030 | | | | | | |

**************************************** LOADINGS ****************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M39 | 761019 | 1100 | (C)761020 | 1100 | 0.057 | 19< | 6* | 0 | 0 | 0 |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 0.051 | 17< | | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | ALUMINUM AL,TOT LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M39 | 761019 | 1100 | (C)761020 | 1100 | 0.057 | 0 | 0 | 0 | 0 |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 0.051 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M39 | 761019 | 1100 | (C)761020 | 1100 | 0.057 | 9< | | 0 | 0 | 0 |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 0.051 | 8< | | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | ALUMINUM AL,TOT KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M39 | 761019 | 1100 | (C)761020 | 1100 | 0.057 | 0 | 0 | 0 | 0 |
| M39 | 761020 | 1100 | (C)761021 | 1030 | 0.051 | 0 | 0 | 0 | 0 |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG OF DAILY FLOW)

### Gould, Inc.--

#### Introduction--

This facility, located at 2215 E. Person Street, manufactures lead acid storage batteries. The plant operates two shifts per day, five days per week, with an employment of approximately 100.

The process consists of casting the lead grids (for plates), pasting and assembling plates into groups, placing groups into battery containers, and strapping them together, covering the battery, flushing with acid and final forming. About 0.9 gallons of water and about 0.6 gallons of sulfuric acid are added to each battery.

#### Wastewater Discharges and Pretreatment Processes--

Wastewater originates primarily from the washdown after plate pasting. Wastewaters also originate from the rinsing of completed batteries before packaging. Sanitary sewage from 100 employees contributes to the total wastewater discharge.

Process wastewater is pretreated with lime before it combines with the sanitary sewage and is discharged into the sewerage system. A series of seven basins with a pH probe at the beginning and end of the system is used in the neutralization process. These basins also remove suspended solids. Sludge is periodically pumped out by a septic tank service. Ultimate disposal of the sludge is unknown.

#### Results--

Two 24-hour composite samples were collected at 30-minute intervals from the company manhole (M-40) on October 18 and 19, and on October 20 and 21, 1976. All process wastewater and sanitary sewage passes through this point before discharging into the city sewerage system.

Flows during the sampling period were estimated using the latest MLG&W water bill. This was necessary since one of the two water meters installed in series indicated negative readings (i.e., the company appeared to be giving water to MLG&W). The most recent monthly bill showed Gould used 1.256 million gallons of water per month; this equates to 57,000 gallons per day (based on 22 work days per month).

The wastewater loads (Table XLIII) were calculated using composite parameter concentrations and estimated daily flows. Production during the sampling was reported to be typical by company personnel. Therefore, the loads discharged during the study are considered to be representative.

The lead (16 mg/l) in the discharge is not specifically treatable by the treatment process employed at the WTP. The daily quantity of lead discharged by this facility constituted approximately 15 percent of the lead discharged into the WTP. The quantity of other metals detected in the discharge (zinc, copper, nickel, cadmium) were negligible.

### TABLE XLIII
### ANALYTICAL RESULTS AND WASTEWATER LOADINGS
GOULD INC.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 0.057 | | | 74 | 50< | 136 |
| M40 | | | 761018 | 1505 | | 25.0 | 10.7 | | | |
| M40 | | | 761019 | 1450 | | 26.0 | 11.0 | | | |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 0.057 | | | 50 | 50< | 152 |
| M40 | | | 761020 | 1530 | | 24.0 | 5.9 | | | |
| M40 | | | 761021 | 1545 | | 24.0 | 9.9 | | | |

| STATION | DATE | TIME | DATE | TIME | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SULFATE SO4-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 124 | 13825 | 20 | 10< | 550 |
| M40 | | | 761018 | 1505 | | | | | |
| M40 | | | 761019 | 1450 | | | | | |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 111 | 10750 | 40 | 10 | 4400 |
| M40 | | | 761020 | 1530 | | | | | |
| M40 | | | 761021 | 1545 | | | | | |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 0.057 | 35 | 0 | 0 | 0 |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 0.057 | 24 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SULFATE SO4-TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 0.057 | 7 | 0 | 0 | 262 |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 0.057 | 9 | 0 | 0 | 2093 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 0.057 | 16 | 0 | 0 | 0 |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 0.057 | 11 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SULFATE SO4-TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M40 | 761018 | 1500 | (C)761019 | 1450 | 0.057 | 3 | 0 | 0 | 119 |
| M40 | 761020 | 1500 | (C)761021 | 1530 | 0.057 | 4 | 0 | 0 | 949 |

### High's Ice Cream Novelties, Inc.--

#### Introduction--

The High's plant, located at 1184 Severson Street, manufactures ice cream novelties. About 40 employees work one shift per day, Tuesday through Friday.

The manufacturing process consists of blending pasteurized ice cream with flavoring, nuts, cones, cookies, etc., depending on the end product desired. The process includes filling molds, freezing, defrosting, and removal from molds. The manufacturing operation runs from 7:00 a.m. until 3:00 p.m.; cleanup operations follow until 9:00 p.m.

#### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from cleaning pasteurization equipment and floors during the cleanup period. Lesser volumes of water are used to rinse molds during the manufacturing process. Cooling water and sanitary wastewater are also discharged with process wastewater. All wastewater is collected in a sump before it is discharged into the sewerage system.

#### Results--

The wastewater discharged into the sump (M-41) was grab sampled in front of the building on two consecutive days (October 19 and 20, 1976). Four samples were collected the first day and three were collected on the second day. Estimates of the flow into the sump were made with a bucket and stopwatch each time a sample was collected.

The samples were composited proportioned to flow each day. Wastewater loads (Table XLIV are based on composite parameter concentrations and the average of the individual wastewater flows determined at the time of sample collection.

The most recent MLG&W water bill showed that the monthly consumption was 1.3 million gallons or 72,500 gallons per day based on an 18-day work month. Cooling water for the compressors is continuous, however, and therefore lowers the daily average below the 72,500 gallons. Flows during the sampling period (average of the individual grab flow measurements) were 94,000 gallons one day and 62,600 gallons the second day. The flows measured during sampling periods were indicative of only the grab sampling, and were not representative of normal continuous discharges during the week. Company personnel stated that operation was normal during the sampling period. Therefore, the wastewater loads discharged (Table XLIV) should be considered as peak daily loads and not representative of the continuous discharge. The untreated wastewater contained high $BOD_5$ (780 mg/1) and COD (1,350 mg/1) concentrations. The TSS concentration was low (75 mg/1). This facility contributed about 0.25 percent of the $BOD_5$, and COD loads into the WTP and was considered to be a minor contributor to the sewerage system.

# TABLE XLIV
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HIGHS ICE CREAM
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M41 | | | 761019 | 0825 | | 20.0 | 7.0 | | | |
| M41 | 761019 | 0825 | (C)761019 | 1630 | 0.094 | | | 632.0 | 78 | 1174 |
| M41 | | | 761019 | 1030 | | 24.0 | 6.9 | | | |
| M41 | | | 761019 | 1410 | | 24.0 | 6.8 | | | |
| M41 | | | 761020 | 0815 | | 23.5 | 7.2 | | | |
| M41 | 761020 | 0815 | (C)761020 | 1630 | 0.063 | | | 932.0 | 80 | 1538 |
| M41 | | | 761020 | 1100 | | 20.0 | 7.9 | | | |
| M41 | | | 761020 | 1630 | | 18.0 | 7.8 | | | |

LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M41 | 761019 | 0825 | (C)761019 | 1630 | 0.094 | 495.8 | 61 | 921 |
| M41 | 761020 | 0815 | (C)761020 | 1630 | 0.063 | 490.0 | 42 | 809 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M41 | 761019 | 0825 | (C)761019 | 1630 | 0.094 | 224.9 | 28 | 418 |
| M41 | 761020 | 0815 | (C)761020 | 1630 | 0.063 | 222.3 | 19 | 367 |

### Hunter Fan and Ventilating Company--

#### Introduction--

The Hunter plant, located at 2500 Frisco Avenue, manufactures electric fans, motors, and electric heaters. The facility operates two shifts per day, five days a week. Total employment is about 300 people. The manufacturing operation consists of complete fabrication of all components from strip steel plus assemblage of motors, heaters, fans, etc.

#### Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from cooling water, sanitary use, four spray booths, and overflow from three and five stage washers using caustic solutions. All wastewaters are discharged without pretreatment to the city sewer system. Sanitary wastewater is discharged separately.

#### Results--

Composite samples of process wastewater and cooling water were collected at 30-minute intervals on two consecutive days (October 20 and 21, 1976) from the manhole (M-42) in front of the building. Wastewater flows were obtained by daily MLG&W water meter readings minus the estimated volume of sanitary wastewater.

Wastewater loads (Table XLV) were determined from composite parameter concentrations and the calculated flow during the sampling period. The most recent water bill from MLG&W showed the monthly use to be 2,199,868 gallons, or 99,000 gpd based on a five day work week (twenty-two workday month). Raw water uses during the sampling period were 92,000 gpd and 94,000 gpd. Company personnel indicated that production was slightly lower than normal and thus may account for the lower than average water use.

Since the flows are nearly representative of normal operating conditions, and since the operation was considered essentially normal by company personnel, the wastewater discharge is assumed to be representative of normal operating conditions.

Except for the 579 mg/l of oil and grease in the discharge on one day (grab sample on October 21, 1976) this facility was considered a minor wastewater contributor to the sewerage system.

# TABLE XLV
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HUNTER FAN & VENTILATING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M42 | 761020 | 0900 | (C)761020 | 2300 | 0.081 | | | | | |
| M42 | | | 761020 | 0915 | | 25.0 | | 6.800 | 40< | |
| M42 | 761021 | 0900 | (C)761021 | 2300 | 0.083 | | | | | 12.00 |
| M42 | | | 761021 | 0915 | | | | 7.400 | 40< | |
| M42 | | | 761022 | 0900 | | 27.0 | 6.8 | | | 579.00 |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|
| M42 | 761020 | 0900 | (C)761020 | 2300 | 0.081 | 4.597 | 27< | 194* |
| M42 | 761021 | 0900 | (C)761021 | 2300 | 0.083 | 5.126 | 28< | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|
| M42 | 761020 | 0900 | (C)761020 | 2300 | 0.081 | 2.085 | 12< | |
| M42 | 761021 | 0900 | (C)761021 | 2300 | 0.083 | 2.325 | 13< | |

* APPROXIMATION OF LOADS (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE OF DAILY FLOWS)

### Hunt Wesson Foods, Incorporated--

### Introduction--

Hunt Wesson, located at 3151 Williams Avenue, manufactures vegetable oils. During the week, operation is continuous with a total three-shift employment of 200. On weekends, ten to twelve people work during each shift.

The manufacturing process consists of producing vegetable oils from soybean and cotton oils through refining, bleaching, hydrogenation, winterization, and deodorization steps.

### Wastewater Discharges and Pretreatment Processes--

The main source of wastewater is from the deodorization procedure, with lesser volumes from refining and other manufacturing steps. Pretreatment consists of floatation and sedimentation followed by neutralization. The mixture of acid and alkaline wastewaters results in a slightly acidic waste, which is ultimately neutralized with caustic or ammonia before being discharged into the sewerage system.

Floatables are sold as cattle feed ingredients; sludge is dredged about once each year and deposited in landfills. Sanitary wastewater is discharged into the sewer.

### Results--

Three consecutive 24-hour composites were collected at 30-minute intervals from the pretreatment system effluent from October 18 through 21, 1976 (M-43). Flows were determined using the company's six-inch Parshall flume.

Wastewater loads (Table XLVI) were determined from composite parameter concentrations and Parshall flume readings. Normal daily effluent wastewater flow ranges from 1.5-2 mgd, and this is consistent with flows determined during the sampling period. Since the effluent flows were representative of normal operating conditions, and since the operation was considered normal by company personnel, the wastewater discharge is assumed to be representative of normal operating conditions.

This discharger was a significant source of $BOD_5$, COD, and oil and grease discharged into the WTP. It accounted for six percent of the $BOD_5$ and four percent of the COD during this study period. The oil and grease concentrations ranged from 295 mg/l to 2,233 mg/l. The high oil and grease concentration (606 mg/l) measured at the WTP influent on October 21, 1976 may have been from the Hunt Wesson plant.

TABLE XLVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
HUNT WESSON
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | PHENOLS TOTAL UG/L | RESIDUE TOT NFLT MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | 1.870 | 26.0 | 1.9 | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | 1.470 | | | 370.0 | | 218 | 2.600 | 492 |
| M43 | | | 761019 | 0945 | 1.870 | | | | 270 | | | |
| M43 | | | 761019 | 0950 | | 30.0 | 6.4 | | | | | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | 1.550 | | | 860.0 | | 25 | 6.300 | 1250 |
| M43 | | | 761020 | 0930 | 1.870 | 25.0 | 5.6 | | 105 | | | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | 1.470 | | | 1998.0> | | 580 | 4.150 | 1823 |
| M43 | | | 761021 | 0930 | 1.870 | 27.0 | 9.8 | | 175 | | | |

| STATION | DATE | TIME | DATE | TIME | OIL-GRSE FREON-GR MG/L | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SULFATE SO4-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | | | | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | | 50< | 40 | 20 | 80< | 69 | 10< | 120 |
| M43 | | | 761019 | 0945 | 295.00 | | | | | | | |
| M43 | | | 761019 | 0950 | | | | | | | | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | | 50< | 58 | 32 | 80 | 87 | 10< | 130 |
| M43 | | | 761020 | 0930 | 620.00 | | | | | | | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | | 50< | 29 | 40 | 80< | 47 | 10< | 110 |
| M43 | | | 761021 | 0930 | 2233.00 | | | | | | | |

************************************************************ LOADINGS ************************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | PHENOLS TOTAL LB/D | RESIDUE TOT NFLT LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CHROMIUM CR,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | 1.870 | | | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | 1.470 | 4539.0 | | 2674 | 31.896 | 6036 | | 1< |
| M43 | | | 761019 | 0945 | 1.870 | | 4 | | | | 4603.68 | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | 1.550 | 11124.3 | | 323 | 81.492 | 16169 | | 1< |
| M43 | | | 761020 | 0930 | 1.870 | | 2 | | | | 9675.54 | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | 1.470 | 24510.6> | | 7115 | 50.919 | 22364 | | 1< |
| M43 | | | 761021 | 0930 | 1.870 | | 3 | | | | 34847.52 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SULFATE SO4-TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | 1.870 | | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | 1.470 | 1 | 0 | 1< | 1 | 0 | 1472 |
| M43 | | | 761019 | 0945 | 1.870 | | | | | | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | 1.550 | 1 | 0 | 1 | 1 | 0 | 1682 |
| M43 | | | 761020 | 0930 | 1.870 | | | | | | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | 1.470 | 0 | 0 | 1< | 1 | 0 | 1349 |
| M43 | | | 761021 | 0930 | 1.870 | | | | | | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | PHENOLS TOTAL KG/D | RESIDUE TOT NFLT KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CHROMIUM CR,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | 1.870 | | | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | 1.470 | 2058.9 | | 1213 | 14.468 | 2738 | | 0< |
| M43 | | | 761019 | 0945 | 1.870 | | 2 | | | | 2088.20 | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | 1.550 | 5045.9 | | 147 | 36.964 | 7334 | | 0< |
| M43 | | | 761020 | 0930 | 1.870 | | 1 | | | | 4388.75 | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | 1.470 | 11117.8> | | 3227 | 23.093 | 10144 | | 0< |
| M43 | | | 761021 | 0930 | 1.870 | | 1 | | | | 15806.58 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SULFATE SO4-TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M43 | | | 761018 | 0945 | 1.870 | | | | | | |
| M43 | 761018 | 0945 | (C)761019 | 0945 | 1.470 | 0 | 0 | 0 | 0 | 0 | 668 |
| M43 | | | 761019 | 0945 | 1.870 | | | | | | |
| M43 | 761019 | 1000 | (C)761020 | 0930 | 1.550 | 0 | 0 | 0 | 1 | 0 | 763 |
| M43 | | | 761020 | 0930 | 1.870 | | | | | | |
| M43 | 761020 | 0930 | (C)761021 | 0930 | 1.470 | 0 | 0 | 0 | 0 | 0 | 612 |
| M43 | | | 761021 | 0930 | 1.870 | | | | | | |

## Kellogg Company--

### Introduction--

The Kellogg plant, located at 2168 Frisco Street, manufactures "ready-to-eat" cereals. Operation is continuous during three shifts per day, six days per week, with a total employment of 600 people.

Raw rice, grains, corn, and bran are steam cooked, dried, milled, recooked (dry), coated, and packaged.

### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is water and steam from cereal cookers and from cleanup during the day and at the end of each shift. This wastewater is pretreated using screens prior to discharge into the sewerage system; screenings are sold as animal feed. Sanitary wastewater is also discharged into the sewerage system along with the process wastewater. All wastewaters pass through a common manhole before discharge. Cooling water (about 0.4 mgd) is discharged separately into a storm sewer. The company has an NPDES permit for this discharge. At the present time, the company uses a well exclusively for water supply; however, they do have a MLG&W connection available.

### Results--

Four consecutive 24-hour composite samples (October 18 through 22, 1976) were collected at 30-minute intervals from the manhole immediately upstream from the company's metering vault (M-44). Flows were determined by using the company's six-inch magnetic flowmeter. Wastewater loadings (Table XLVII) were calculated from composite parameter concentrations and the flow data from the magnetic flowmeter.

Flows obtained during the sampling period were typical of normal flows as determined over the past few months. Since the operation was considered normal during the study period, the loads should be considered representative of typical operations.

This discharger is a significant contributor to the sewerage system since it accounted for three percent of the $BOD_5$, two percent of the TSS, and almost four percent of the COD discharged into the WTP. The $BOD_5$ and COD concentrations in the discharge averaged about five times that of a typical domestic sewage (1,560 mg/l and 3,110 mg/l, respectively).

# TABLE XLVII
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KELLOGG
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M44 | | | 761018 | 0820 | | 26.5 | 6.3 | | | |
| M44 | 761018 | 0830 | (C)761019 | 0830 | 0.552 | | | 1199.0 | 350 | 2640 |
| M44 | 761019 | 0900 | (C)761020 | 0830 | 0.507 | | | 1498.0 | 745 | 3326 |
| M44 | | | 761019 | 0915 | | 28.0 | 6.1 | | | |
| M44 | | | 761020 | 0830 | | 23.0 | 5.9 | | | |
| M44 | 761020 | 0830 | (C)761021 | 0855 | 0.537 | | | 2299.0 | 610 | 3064 |
| M44 | | | 761021 | 0815 | | 20.0 | 6.0 | | | |
| M44 | 761021 | 0900 | (C)761022 | 0900 | 0.564 | | | 1265.0 | 490 | 3427 |
| M44 | | | 761022 | 0900 | | 21.5 | 7.8 | | | |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M44 | 761018 | 0830 | (C)761019 | 0830 | 0.552 | 5523.3 | 1612 | 12161 |
| M44 | 761019 | 0900 | (C)761020 | 0830 | 0.507 | 6338.1 | 3152 | 14073 |
| M44 | 761020 | 0830 | (C)761021 | 0855 | 0.537 | 10302.8 | 2734 | 13731 |
| M44 | 761021 | 0900 | (C)761022 | 0900 | 0.564 | 5954.0 | 2306 | 16130 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M44 | 761018 | 0830 | (C)761019 | 0830 | 0.552 | 2505.3 | 731 | 5516 |
| M44 | 761019 | 0900 | (C)761020 | 0830 | 0.507 | 2874.9 | 1430 | 6383 |
| M44 | 761020 | 0830 | (C)761021 | 0855 | 0.537 | 4673.3 | 1240 | 6228 |
| M44 | 761021 | 0900 | (C)761022 | 0900 | 0.564 | 2700.7 | 1046 | 7316 |

The Kroger Company--

### Introduction--

The Kroger facilities, located at 2330 Frisco Street, include an office complex, warehouse, distribution center, truck maintenance garage and meat processing plant. Only the meat processing plant was investigated during the study. This plant employs about 50 people and operates two eight-hour shifts a day, six days per week.

The operation consists of cutting animal quarters into "saw-ready-cuts" which are then shipped to retail stores for final cutting. No slaughtering or quartering operations are performed at this plant. The cutting operation is conducted during the first shift, while the second shift is devoted to cleanup operations.

### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is the cleanup operation during the second shift and it accounts for the greatest volume of flow from the meat plant. Wastewater during the first shift is from wash water used during the cutting operation. Sanitary wastewater is discharged with the process waste.

Two grease traps in series remove floatable solids. When required, the traps are cleaned by a septic tank service company. Ultimate disposal of the sludge and scum is unknown. Meat plant wastewaters flow via a lift station to an in-plant sewer that also receives wastes from the other operations in the Kroger complex.

### Results--

To distinguish between the cutting operation (first shift) and cleanup (second shift), two separate composite samples were taken each day. One composite sample was taken during each shift for two consecutive days (October 19 and 20, 1976) from the lift station discharge (M-45). These composite samples were collected at 30-minute intervals. Flow volumes were determined using the meat plant's water meter. Since there were no consumptive losses, the raw water used was assumed to be discharged.

Wastewater loads (Table XLVIII) were calculated using composite parameter concentrations and the meat plant's flow volumes. Company personnel indicated that operations were normal during the investigation, and thus the discharges are assumed to be representative.

There was no appreciable difference in wastewater constituent concentrations between the cutting and cleanup operations. However, slightly greater quantities of water were used during the cleanup operation. The low concentrations of pollutants detected, along with low flow volumes, relegate this discharge to a minor contributor status.

TABLE XLVIII
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KROGER
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M45A | | | 761018 | 1605 | | 26.0 | 6.6 | | | | |
| M45A | 761019 | 0900 | (C)761019 | 1530 | 0.005 | | | 193.0 | 90 | 393 | |
| M45A | | | 761019 | 1530 | | 24.0 | 7.2 | | | | |
| M45A | | | 761019 | 1545 | | | | | | | 22.00 |
| M45A | 761020 | 0700 | (C)761020 | 1530 | 0.008 | | | 90.0 | 20 | 100 | |
| M45A | | | 761020 | 1530 | | 15.0 | 7.3 | | | | |

******************************* LOADINGS *******************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/C | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M45A | 761019 | 0900 | (C)761019 | 1530 | 0.005 | 8.1 | 4 | 16 | 1.2* |
| M45A | 761020 | 0700 | (C)761020 | 1530 | 0.008 | 6.0 | 1 | 7 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M45A | 761019 | 0900 | (C)761019 | 1530 | 0.005 | 3.7 | 2 | 7 | |
| M45A | 761020 | 0700 | (C)761020 | 1530 | 0.008 | 2.7 | 1 | 3 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|
| M45B | 761019 | 1530 | (C)761019 | 2100 | 0.008 | 185.0 | 40 | 330 |
| M45B | 761020 | 1530 | (C)761020 | 2130 | 0.009 | 163.0 | 60 | 347 |

********************* LOADINGS *********************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M45B | 761019 | 1530 | (C)761019 | 2100 | 0.008 | 12.4 | 3 | 22 |
| M45B | 761020 | 1530 | (C)761020 | 2130 | 0.009 | 12.2 | 5 | 26 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M45B | 761019 | 1530 | (C)761019 | 2100 | 0.008 | 5.6 | 1 | 10 |
| M45B | 761020 | 1530 | (C)761020 | 2130 | 0.009 | 5.6 | 2 | 12 |

* APPROXIMATION OF LOAD (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE DAILY FLOW)

### Memphis Furniture Company--

### Introduction--

The Memphis Furniture Company, located on Frisco Street, produces wood furniture. About 160 employees work at the plant, one shift per day.

The facility is classified as a wood-working case goods plant. Raw wood is worked into finished wooden bedroom furniture including chests, dressers, beds, etc. Finishing or painting of the furniture at spray booths is the final production process.

### Wastewater Discharges and Pretreatment Processes--

Sanitary sewage and batch discharges from nine paint spray booths make up the wastewater discharge from this facility. These booths are arranged in sets of three, with wastewater from each set discharging into separate sumps before subsequent discharge into the sewerage system. Only one booth is cleaned each day, allowing a nine-day recycle time between cleanings.

The only treatment provided is the collection of scum in the sumps, and periodic sump cleaning by septic tank cleaning services. Ultimate disposal of the sludge is unknown. Sanitary sewage is discharged into the city sewer separately.

### Results--

Composite samples were collected at two to five minute intervals on two consecutive days (October 20 and 21) during spray booth draining operations. The samples were collected directly from the lines draining into one of the three sumps (M-46). Flows were determined each day from the spray booth volumes.

The operation was considered normal by company personnel during the study; therefore, these batch dumps were considered representative of the normal wastewater discharge. The wastewater contained low concentrations of zinc, copper, and lead (Table XLIX). These low concentrations, coupled with a very low flow of 500 gallons per day, makes this discharge a minor contributor of wastewater into the sewerage system.

TABLE XLIX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MEMPHIS FURNITURE
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 0.000 | | | | 255 | |
| M46 | | | 761020 | 1510 | | 15.0 | 6.5 | | | |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 0.000 | | | 666.0< | 1370 | 1052 |
| M46 | | | 761021 | 1510 | | 18.0 | 8.2 | | | |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 50< | 390 | 103 | 80< | 20< | 10< |
| M46 | | | 761020 | 1510 | | | | | | |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 50< | 400 | 27 | 310 | 10< | 10< |
| M46 | | | 761021 | 1510 | | | | | | |

**************************************************** LOADINGS ****************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 0.000 | | 1 | | 0 | 0 |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 0.000 | 2.8< | 6 | 4 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 0.000 | 0 | 0 | 0 | 0 |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 0.000 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 0.000 | | 0 | | 0 | 0 |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 0.000 | 1.3< | 3 | 2 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M46 | 761020 | 1500 | (C)761020 | 1530 | 0.000 | 0 | 0 | 0 | 0 |
| M46 | 761021 | 1500 | (C)761021 | 1530 | 0.000 | 0 | 0 | 0 | 0 |

### Midwest Farms--

### Introduction--

The Midwest Farms Plant, located at 1039 South Bellevue Street, bottles milk, milk products, and orange juice. Operation is continuous five to six days per week, with a total employment of 25 to 30 people.

The operation consists of standardizing, pasteurizing and bottling raw milk (delivered by truck). Buttermilk and chocolate milk are also produced. Reconstituted orange juice is the only product to which water is added. However, this consumptive use is negligible when compared to the total water consumption of this facility.

### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from cleanup with almost a negligible volume from sanitary sources. All wastewater is combined in a sump in the building before discharge without pretreatment into the city sewerage system.

### Results--

Two consecutive 24-hour composite samples, collected at 30-minute intervals, were obtained from the sump in the building (M-47) from October 18 through 20, 1976. Discharge flow volumes were determined from daily readings of the MLG&W water meter. Consumptive loss in the product was considered to be negligible. Wastewater loadings (Table L) were determined from composite parameter concentrations and MLG&W meter flows.

The most recent water bill from MLG&W showed the monthly use to be 1,403,996 gallons. This represents about 70,200 gallons per day based on 20 working days per month. Raw water usage during the sampling period was

48,600 gallons per day and 42,600 gallons per day, respectively. Company personnel indicated that production was about normal; however, lower than normal wastewater flows do not reflect this. Loads discharged during the study period were considered lower than normal and not representative of typical discharge.

The untreated wastewater contained high concentrations of $BOD_5$ (1,030 mg/1), and COD (1,650 mg/1). The TSS concentrations were only slightly greater than domestic sewage (390 mg/1). The facility contributed less than 0.2 percent of the total $BOD_5$, COD and TSS into the WTP and was considered a minor discharger to the sewerage system.

TABLE L
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MIDWEST FARMS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M47 | | | 761018 | 1055 | | | 6.8 | | | |
| M47 | 761018 | 1100 | (C)761019 | 1100 | 0.049 | | | 920.0 | 315 | 1736 |
| M47 | | | 761019 | 1100 | | 18.0 | 6.9 | | | |
| M47 | 761019 | 1100 | (C)761020 | 1040 | 0.043 | | | 1140.0 | 460 | 1572 |
| M47 | | | 761020 | 1045 | | 18.0 | 6.4 | | | |

**************************************************** LOADINGS ****************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M47 | 761018 | 1100 | (C)761019 | 1100 | 0.049 | 376.2 | 129 | 710 |
| M47 | 761019 | 1100 | (C)761020 | 1040 | 0.043 | 409.1 | 165 | 564 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M47 | 761018 | 1100 | (C)761019 | 1100 | 0.049 | 170.6 | 58 | 322 |
| M47 | 761019 | 1100 | (C)761020 | 1040 | 0.043 | 185.6 | 75 | 256 |

### Crown-Zellerbach Corporation--

#### Introduction--

Crown-Zellerbach is a corrugated box manufacturer located at 611 Winchester Road. The facility employs 55 people in a five day per week, 16-hour per day operation.

The process consists of corrugating (molding and gluing) kraft paper into sheets (cardboard) and pressing the sheets (cutting and scoring) with an optional box construction phase (stitch gluing or pasting).

#### Wastewater Discharges and Pretreatment Processes--

Wastewaters are generated at three sites: (1) rinse waters used in the pressing department; (2) process water used in the corrugating department; and (3) cleanup water used in the glue mixing department.

Pretreatment consists of a dual chamber tank. The first chamber is a grease sump, the second chamber is a settling tank. Sludge is periodically pumped out by a septic tank service; ultimate disposal is not known. Domestic wastewaters are discharged from separate lines directly into the city sewerage system.

#### Results--

Plant wastewater was sampled at the cleanout just downstream from the pretreatment tank. The site (M-51) was sampled for 14-hour periods at 30-minute intervals on two consecutive days. Flowrates were determined from daily MLG&W water meter readings minus daily domestic consumption. Discharge flows used in the loading analyses were 21,605 gpd during the period of October 19 through 20, 1976; and 21,827 gpd during the period of October 20 through 21, 1976.

Company records indicate an average monthly usage of 61,666 cubic feet of water based on the last three months. This equates to a daily water usage of 21,450 gpd and a discharge (usage less sanitary flow) to the sewer of 19,804 gpd. Operation during the sampling period was considered normal by company personnel. Analytical results are presented in Table LI. This facility was considered a minor discharger.

# TABLE LI
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CROWN ZELLERBACH
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M51 | 761019 | 0710 | (C)761019 | 2400 | 0.022 |  |  | 130.0 | 46 | 131 |
| M51 | 761020 | 0715 | (C)761020 | 2400 | 0.022 |  |  | 120.0 | 145 | 252 |
| M51 |  |  | 761020 | 0723 |  | 18.0 | 9.0 |  |  |  |
| M51 |  |  | 761021 | 0815 |  | 19.0 | 5.9 |  |  |  |

## LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M51 | 761019 | 0710 | (C)761019 | 2400 | 0.022 | 23.4 | 8 | 24 |
| M51 | 761020 | 0715 | (C)761020 | 2400 | 0.022 | 21.8 | 26 | 46 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M51 | 761019 | 0710 | (C)761019 | 2400 | 0.022 | 10.6 | 4 | 11 |
| M51 | 761020 | 0715 | (C)761020 | 2400 | 0.022 | 9.9 | 12 | 21 |

Klinke Brothers Ice Cream Company--

Introduction--

The Klinke Brothers plant, located at 2450 Scaper Street, produces ice cream during one ten-hour production shift per day, five days per week. Approximately 20 office and production people are employed at the plant.

The basic process consists of blending sweet cream and ice cream with flavorings, sugar, and a stabilizer. The mixture is then pasteurized, homogenized, packaged, and frozen.

Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater flow is from cleanup operations between batches during production periods and end of the day cleanup. Sanitary sewage is also discharged. All wastewaters combine at a sump before they are discharged into the city sewerage system. When required, a septic tank service cleans the sump. Ultimate disposal of the sludge and scum is unknown.

Results--

Two eleven-hour composite samples, with aliquots collected at 30-minute intervals, were obtained for two sampling periods (October 19 and 20, 1976) from the sump (M-56). Discharge volumes were determined from daily readings of the MLG&W water meters. There is no consumptive loss in the operation; thus, the raw water volume was assumed to be equal to the discharge volume. The wastewater loads (Table LII) were determined from composite parameter concentrations and MLG&W meter readings.

The most recent water bill showed the monthly use to be about 292,000 gallons; i.e., 13,300 gallons per day based on 22 work days per month.

During the sampling period, the flow was 8,000 gallons the first day and 11,000 gallons the second day.

Company personnel indicated that operations were normal. Lower than normal water usage during the study period was probably due to less ice cream demand during the cooler weather. Therefore, the loads discharged are considered to be representative for the time of year samples were collected.

The untreated wastewater contained high concentrations of $BOD_5$ (3,200 mg/l), COD (5,979 mg/l) and TSS (1,260 mg/l). However, it accounted for only about 0.1 percent of $BOD_5$, COD, and TSS loads discharged into the WTP, and was considered to be a minor discharger.

## TABLE LII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
## KLINKE BROS. ICE CREAM
## MEMPHIS, TN
## OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M56 | | | 761019 | 0830 | | 22.0 | 6.9 | | | |
| M56 | 761019 | 0830 | (C)761019 | 2100 | 0.008 | | | 3600.0 | 1160 | 5364 |
| M56 | 761020 | 0630 | (C)761020 | 2115 | 0.011 | | | 2800.0 | 1365 | 6587 |
| M56 | | | 761020 | 0640 | | 21.0 | 6.8 | | | |

**************************** LOADINGS ****************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M56 | 761019 | 0830 | (C)761019 | 2100 | 0.008 | 240.3 | 77 | 358 |
| M56 | 761020 | 0630 | (C)761020 | 2115 | 0.011 | 257.0 | 125 | 605 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M56 | 761019 | 0830 | (C)761019 | 2100 | 0.008 | 109.0 | 35 | 162 |
| M56 | 761020 | 0630 | (C)761020 | 2115 | 0.011 | 116.6 | 57 | 274 |

Keathleys--

## Introduction--

Keathleys, a division of Fairmont Foods, is a bakery located at 965 Philadelphia Street. About 100 people are employed in a three-shift operation four to five days per week.

Brownies, pecan pies and cakes are the principal products of this bakery. The first shift has three bake lines: the second shift has one line; the third shift is devoted to cleanup.

## Wastewater Discharges and Pretreatment Processes--

Wastewater, primarily derived from cleanup operations and sanitary sewage, is conveyed into a sump in the building before discharging into the sewerage system. Floatable solids and sludge which remain in the sump are removed, when warranted, by a septic tank cleanout service. Ultimate disposal of these solids by this service is not known.

## Results--

Three consecutive 24-hour composite samples (October 18 through 21, 1976) were collected at 30-minute intervals from the sump (M-67). Wastewater flow was to be determined by reading the three MLG&W water meters and subtracting consumptive product loss. However, one of three meters was inoperative, and the actual volume was not determined in the field. Instead, the average flow for the past four months was determined from MLG&W water bills and assumed to be the flow for the sampling period. Therefore, the wastewater loads (Table LIII) are based on composite parameter concentrations and average flows, and may not be representative of normal operating conditions. The MLG&W meter should be repaired so accurate flow measurements can be made.

The $BOD_5$, TSS, and COD concentrations were high (1,100 mg/l, 920 mg/l, and 3,740 mg/l, respectively). However, the facility contributed less than 0.2 percent of the total load into the WTP.

## TABLE LIII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
KEATHLEY INC.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M67 | 761018 | 1200 | (C)761019 | 1150 | 0.024 | | | 1100.0> | 395 | 2842 |
| M67 | | | 761018 | 1205 | | 25.0 | 4.4 | | | |
| M67 | | | 761019 | 1150 | | 24.0 | 5.4 | | | |
| M67 | 761019 | 1200 | (C)761020 | 1140 | 0.024 | | | 1100.0> | 630 | 3326 |
| M67 | | | 761020 | 1140 | | 21.5 | 4.6 | | | |
| M67 | 761020 | 1140 | (C)761021 | 1115 | 0.024 | | | 1100.0> | 1735 | 5060 |
| M67 | | | 761021 | 1115 | | 23.0 | 4.3 | | | |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|---|
| M67 | 761018 | 1200 | (C)761019 | 1150 | 0.024 | 220.3> | 79 | 569 |
| M67 | 761019 | 1200 | (C)761020 | 1140 | 0.024 | 220.3> | 126 | 666 |
| M67 | 761020 | 1140 | (C)761021 | 1115 | 0.024 | 220.3> | 347 | 1013 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|---|
| M67 | 761018 | 1200 | (C)761019 | 1150 | 0.024 | 99.9> | 36 | 258 |
| M67 | 761019 | 1200 | (C)761020 | 1140 | 0.024 | 99.9> | 57 | 302 |
| M67 | 761020 | 1140 | (C)761021 | 1115 | 0.024 | 99.9> | 158 | 460 |

### J. Strickland and Company--

#### Introduction--

The facility, located at 1400 Ragan Street, manufactures hair preparations. The plant operates one eight-hour shift per day, five days per week. About 60 people are employed, with 30 working in the manufacturing operation and 30 office personnel.

The process consists of heating and blending petroleum jelly with perfumes and oils to produce a finished product which is then packaged. Heat is necessary to completely blend all ingredients with the petroleum jelly.

#### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from kettle cleanout between product batches. The cleaning process consists of washing the kettles with steam, soapy water, and then rinsing. Cooling water and sanitary sewage are combined with the process wastewater discharge. No pretreatment is provided.

#### Results--

Two eight-hour composite samples of the combined discharge were collected at 30-minute intervals for two consecutive days (October 20 and 21, 1976) from a sewer cleanout inside the building (M-71). Flow was determined using the MLG&W water meter. Negligible water is used in the product; therefore, the city water usage was assumed to equal the wastewater discharged. Wastewater loads (Table LIV) were determined from composite parameter concentrations and the flows from MLG&W water meter readings. The most recent water bill from MLG&W showed the monthly use to be about 350,000 gallons, i.e., 15,700 gallons per day based on 22 workdays per month. Raw water used during the sampling period was 8,400 gallons the first day and 11,000 gallons the second day. Lower than normal flows during the sampling period indicate that production may have been less than normal. Therefore, the discharge during the study period should be considered less than normal and not representative of the typical discharge.

The $BOD_5$ and COD concentrations during the first sampling period were high (>600 and 1,457 mg/l, respectively). However, the loads discharged that day were only 40 and 97 lbs/day, respectively. The low flows discharged and the absence of toxic substances in the wastewater classify the facility as a minor contributor.

TABLE LIV
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
J. STRICKLAND
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M71 | 761020 | 0830 | (C)761020 | 1630 | 0.008 | | | 600.0> | 1457 | |
| M71 | | | 761020 | 0845 | | 22.0 | 7.0 | | | |
| M71 | 761021 | 0800 | (C)761021 | 1630 | 0.011 | | | 121.0 | 343 | |
| M71 | | | 761021 | 0815 | | 45.0 | | | | 35.00 |
| M71 | | | 761022 | 0840 | | 50.5 | 6.8 | | | |

************************************************ LOADINGS **************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|
| M71 | 761020 | 0830 | (C)761020 | 1630 | 0.008 | 40.1> | 97 | 2.8* |
| M71 | 761021 | 0800 | (C)761021 | 1630 | 0.011 | 11.1 | 31 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|
| M71 | 761020 | 0830 | (C)761020 | 1630 | 0.008 | 18.2> | 44 | |
| M71 | 761021 | 0800 | (C)761021 | 1630 | 0.011 | 5.0 | 14 | |

* APPROXIMATION OF LOADS (CALCULATED BY USING GRAB CONCENTRATIONS AND AVERAGE DAILY FLOW)

### Pro-Serv, Incorporated--

### Introduction--

Pro-Serv is a herbicide manufacturer located at 400 East Brooks Road. The work force consists of 18 people who are engaged in a five day per week, 24-hour per day operation.

The facility formulates raw chemicals into herbicide powders, pellets, and granules. Ramrod 65, Prometon, and ramrod 65 with atrazine make up the product line.

### Wastewater Discharges and Pretreatment Processes--

Wastewaters are derived from runoff in and around the immediate processing building. Runoff is channeled to sump pumps (north and south) located on either side of the structure. From the sumps, wastewaters are pumped to a common 16,000 gallon holding tank. When the tank volume reaches approximately 13,000 gallons, the contents are analyzed. The analytical results are submitted to the WTP personnel for approval to batch dump the contents.

### Results--

Sampling consisted of two grab samples collected from the tank (site M-73) and composited on October 19, 1976. The tank contents are discharged to the city sewer system at an approximate rate of once every two months. Plant personnel stated that the tank may have a detectable concentration of chlordane due to a past accident. Company personnel indicated that plant operation during the study was normal. Analytical results are presented in Table LV.

This facility is classified as a major discharger due to the toxic organic compounds detected. Trichloroethylene, toluene, ethyl benzene, methylene chloride, and chlordane, which were detected in the tank contents, are all on EPA's Consent Decree: "65 Toxic Chemicals List." The chlordane concentration was 500 mg/l; however, this compound is no longer in use, and its detection was expected because of a past spill. In addition, ramrod was detected at a concentration of 14,000 mg/l.

## TABLE LV
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
PRO SERV
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L |
|---|---|---|---|---|---|---|---|
| M73 | 761021 | 1110 | (C)761021 | 1500 | 0.013 | 3339 | 8905 |

****************************** LOADINGS ******************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D |
|---|---|---|---|---|---|---|---|
| M73 | 761021 | 1110 | (C)761021 | 1500 | 0.013 | 362 | 966 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D |
|---|---|---|---|---|---|---|---|
| M73 | 761021 | 1110 | (C)761021 | 1500 | 0.013 | 164 | 438 |

# PRESIDENTS ISLAND BASIN

### Cargill, Incorporated--

#### Introduction--

Cargill, located at 1877 Channel Avenue on Presidents Island, manufactures soybean meal and soybean oil. The facility operates continuously with a total employment of 80 persons.

The process consists of solvent extraction of soybeans. Production steps include cracking soybeans, heating, flaking, extracting, drying and grinding of meal, and storage.

#### Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is the continuous boiler blowdown. Wastewater from skimming pits, steam condensation, spillage, and sanitary sewage are discharged with process wastewater. All wastewaters are discharged into the city sewerage system without treatment. Cooling water is discharged to McKellar Lake. The company has an NPDES permit for this discharge.

#### Results--

Three consecutive 24-hour composite samples collected at 30-minute intervals were obtained at the manhole (M-80) in front of the mill office building from October 25 through 28. Flows were obtained by daily readings of the MLG&W water meter minus estimated consumptive uses. The consumptive water use consists of approximately thirty percent of incoming flow and includes waters in the soybean meal and waters exhausted to the atmosphere. Cooling water is obtained from deep wells.

Wastewater loads (Table LVI) were determined from composite parameter concentrations and the calculated flow during the inspection period. The most recent water bill from MLG&W showed the monthly use to be approximately 6.42 million gallons or 214,000 gallons per day based on the 30 day work month. Raw water used during the sampling period ranged from 175,000 gallons per day to 246,000 gallons per day. Company personnel indicated that production was about normal.

Since the flows are nearly representative of normal operating conditions, and since the operation was considered normal by company personnel during the visit, the wastewater discharged is assumed to be representative of normal operating conditions. Wastewaters from this facility are similar to domestic sewage.

# TABLE LVI
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CARGILL, INC.
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | TOT KJEL N MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M80 | | | 761025 | 1100 | | 40.0 | 6.8 | | | |
| M80 | 761025 | 1100 | (C)761026 | 1000 | 0.123 | | | 340.0 | 20 | 5.40 |
| M80 | | | 761026 | 1040 | | 60.0 | 10.4 | | | |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 0.173 | | | 173.0 | 5 | 3.72 |
| M80 | | | 761027 | 0945 | | 48.0 | 6.7 | | | |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 0.168 | | | 1399.0 | 188 | 3.55 |
| M80 | | | 761028 | 0915 | | 40.0 | 6.1 | | | |

| STATION | DATE | TIME | DATE | TIME | NH3-N TOTAL MG/L | NO2&NO3 N-TOTAL MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M80 | | | 761025 | 1100 | | | | | |
| M80 | 761025 | 1100 | (C)761026 | 1000 | 4.90 | 0.01< | 0.420 | 344 | |
| M80 | | | 761026 | 1040 | | | | | 61.00 |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 3.52 | 0.01< | 0.410 | 222 | |
| M80 | | | 761027 | 0945 | | | | | 108.00 |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 2.90 | 0.01< | 0.810 | 2663 | |
| M80 | | | 761028 | 0915 | | | | | 369.00 |

************************** LOADINGS **************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | NH3-N TOTAL LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M80 | 761025 | 1100 | (C)761026 | 1000 | 0.123 | 349.0 | 21 | 5.54 | 5.03 |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 0.173 | 249.8 | 7 | 5.37 | 5.08 |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 0.168 | 1961.4 | 264 | 4.98 | 4.07 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M80 | 761025 | 1100 | (C)761026 | 1000 | 0.123 | 0.01< | 0.431 | 353 | 231* |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 0.173 | 0.01< | 0.592 | 321 | |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 0.168 | 0.01< | 1.136 | 3734 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | NH3-N TOTAL KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M80 | 761025 | 1100 | (C)761026 | 1000 | 0.123 | 158.3 | 9 | 2.51 | 2.28 |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 0.173 | 113.3 | 3 | 2.44 | 2.31 |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 0.168 | 889.7 | 120 | 2.26 | 1.84 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M80 | 761025 | 1100 | (C)761026 | 1000 | 0.123 | 0.00< | 0.196 | 160 | |
| M80 | 761026 | 1100 | (C)761027 | 1000 | 0.173 | 0.01< | 0.268 | 145 | |
| M80 | 761027 | 1000 | (C)761028 | 0900 | 0.168 | 0.01< | 0.515 | 1694 | |

* APPROXIMATION OF LOAD , ( CALCULATED W/AVG OF DAILY GRAB CONCENTRATION AND AVG OF DAILY FLOW ).

### Cargill, Incorporated--

#### Introduction--

The Cargill plant, located at 2330 Buoy Street on Presidents Island, produces corn syrup, corn starch, and feed byproducts. Operation is continuous (three shifts per day, seven days per week) with 15 to 20 production employees per shift.

The operation is classified as a wet corn milling process. Corn which arrives either by barge or by rail is cleaned, stored, and cleaned again before going to steep tanks for soaking in warm water. The steep water is drawn off and the softened kernels go to degerminating mills and on to separators where the oil-laden germs are removed and the oil is extracted. The remaining slurry of starch, gluten, and hulls is ground finely, then passed through reels and shaken for hull removal. Starch and gluten are then separated in centrifuges. The starch is washed, dried, prepared for shipment as starch and dextrin, or converted into syrup and dextrose.

#### Wastewater Discharges and Pretreatment Processes--

The major source of wastewater is condensate from evaporators in the steamhouse and refining areas. Significant volumes of wastewater also originate in the grinding and washing operations. There is no pretreatment per se; however, in-plant controls return most solids to the process. Cooling water discharges into McKellar Lake (there is an NPDES permit for this discharge). Sanitary wastewater discharges separately into the sewerage system.

Results--

Three consecutive 24-hour composite samples, collected at 30-minute intervals were obtained at the Parshall flume pit (M-81) from October 25 to 28, 1976. Flows were determined using the company's 6-inch Parshall flume.

Wastewater loads (Table LVII) were based on the composite parameter concentrations and the daily flows determined with the Parshall flume. Over the past few months, the daily flows ranged from 0.75 to 1 mgd, and this is consistent with flows during the sampling period. Company personnel indicated that the operation was not up to normal at the time of the sampling. The facility is new (operation began in May 1976). Usually, a period of six months or more is required to bring this type of operation to normal production. At that time, company personnel indicate that wastewater and waste loads should decrease if similar operations can be used as a guide.

This discharger is the most significant source of $BOD_5$, COD, and TSS served by the Presidents Island interceptor. The $BOD_5$ loadings ranged from 22,000 lbs/day to 52,000 lbs/day; COD ranged from 25,000 lbs/day to 107,000 lbs/day; TSS ranged from 5,000 lbs/day to 28,000 lbs/day. During the third sampling period (October 27 through 28, 1976), operational problems in the facility caused notably higher concentrations in all parameters measured.

If this Cargill plant discharged into the WTP during the study, it would have accounted for about ten percent of the influent $BOD_5$ and COD, and about five percent of the TSS influent loadings. When the Presidents Island interceptor is connected to the WTP, this additional wastewater will contribute to existing overloading conditions experienced at the plant.

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                                   TABLE LVII
                    ANALYTICAL RESULTS AND WASTEWATER LOADINGS
                                  CARGILL, INC.
                                   MEMPHIS, TN
                                  OCTOBER, 1976

------------------------------------------------------------------------------------------------------------
                                          CONDUIT     WATER        PH          BOD      RESIDUE    TOT KJEL
                                           FLOW        TEMP                    5 DAY    TOT NFLT      N
STATION   DATE   TIME    DATE   TIME       MGD         CENT        SU          MG/L       MG/L       MG/L

MB1      761025 1000 (C)761026 0900       0.790
MB1                     761025 1020       1.120                               3900.0       760      50.00
MB1      761026 0900 (C)761027 0900       0.840        27.0        4.0
MB1                     761026 0930       0.700                               3100.0      1240      68.50
MB1      761027 0900 (C)761028 0900       0.720
MB1                     761027 0910       0.700                               8666.0      4635     275.00
MB1                     761028 0830       0.700        10.0        4.5
                                                       30.0        3.5
------------------------------------------------------------------------------------------------------------
                                          NH3-N      NO2&NO3    PHOS-TOT       COD       OIL-GRSE
                                          TOTAL      N-TOTAL                HI LEVEL    FREON-GR
STATION   DATE   TIME    DATE   TIME       MG/L        MG/L      MG/L P        MG/L        MG/L

MB1      761025 1000 (C)761026 0900        1.80        0.02       9.400        3893
MB1                     761025 1020
MB1      761026 0900 (C)761027 0900        1.75        0.01<     13.600        6761
MB1                     761026 0930
MB1      761027 0900 (C)761028 0900        1.85        0.06      71.500       17930         8.00
MB1                     761027 0910
MB1                     761028 0830                                                        21.00
                                                                                          152.00
*********************************************** LOADINGS ***********************************************
------------------------------------------------------------------------------------------------------------
                                          CONDUIT       BOD      RESIDUE    TOT KJEL      NH3-N
                                           FLOW        5 DAY     TOT NFLT       N         TOTAL
STATION   DATE   TIME    DATE   TIME       MGD         LB/D        LB/D       LB/D         LB/D

MB1      761025 1000 (C)761026 0900       0.790      25711.9       5011      329.64       11.87
MB1                     761025 1020       1.120
MB1      761026 0900 (C)761027 0900       0.840      21731.2       8692      480.19       12.27
MB1                     761026 0930       0.700
MB1      761027 0900 (C)761028 0900       0.720      52070.7      27850     1652.37       11.12
MB1                     761027 0910       0.700
MB1                     761028 0830       0.700
------------------------------------------------------------------------------------------------------------
                                          CONDUIT    NO2&NO3    PHOS-TOT       COD       OIL-GRSE
                                           FLOW      N-TOTAL                HI LEVEL    FREON-GR
STATION   DATE   TIME    DATE   TIME       MGD         LB/D        LB/D        LB/D        LB/D

MB1      761025 1000 (C)761026 0900       0.790        0.13      61.972       25666
MB1                     761025 1020       1.120
MB1      761026 0900 (C)761027 0900       0.840        0.07<     95.337       47395
MB1                     761026 0930       0.700
MB1      761027 0900 (C)761028 0900       0.720        0.36     429.616      107734        46.73
MB1                     761027 0910       0.700
MB1                     761028 0830       0.700                                          122.60
                                                                                          887.94
------------------------------------------------------------------------------------------------------------
                                          CONDUIT       BOD      RESIDUE    TOT KJEL      NH3-N
                                           FLOW        5 DAY     TOT NFLT       N         TOTAL
STATION   DATE   TIME    DATE   TIME       MGD         KG/D        KG/D       KG/D         KG/D

MB1      761025 1000 (C)761026 0900       0.790      11662.7       2273      149.52        5.38
MB1                     761025 1020       1.120
MB1      761026 0900 (C)761027 0900       0.840       9857.1       3943      217.81        5.56
MB1                     761026 0930       0.700
MB1      761027 0900 (C)761028 0900       0.720      23618.9      12633      749.50        5.04
MB1                     761027 0910       0.700
MB1                     761028 0830       0.700
------------------------------------------------------------------------------------------------------------
                                          CONDUIT    NO2&NO3    PHOS-TOT       COD       OIL-GRSE
                                           FLOW      N-TOTAL                HI LEVEL    FREON-GR
STATION   DATE   TIME    DATE   TIME       MGD         KG/D        KG/D        KG/D        KG/D

MB1      761025 1000 (C)761026 0900       0.790        0.06      28.110       11642
MB1                     761025 1020       1.120
MB1      761026 0900 (C)761027 0900       0.840        0.03<     43.244       21490
MB1                     761026 0930       0.700
MB1      761027 0900 (C)761028 0900       0.720        0.16     194.870       48867        21.20
MB1                     761027 0910       0.700
MB1                     761028 0830       0.700                                           55.64
                                                                                          402.76
```

Mid-South Plating Company, Inc.--

Introduction--

Mid-South Plating, located at 1520 Channel Avenue on Presidents Island, is a commercial metal finisher, operating three shifts per day, five days per week, with a total employment of 18 people.

The facility operates three plating lines and has the capability for zinc, cadmium, and bronze plating. Both barrel and rack lines are used. All three lines usually operate during the first shift, two during the second shift, and one on the third shift. Each line has the following units: alkaline cleaner; rinse; muriatic acid pickling; continuous rinse; plating; counter-flow rinse; chromate dip; double rinse; hot water rinse; drying, and packaging.

Wastewater Discharges and Pretreatment Processes--

The primary sources of wastewater are from the rinsing operations with negligible volumes from sanitary sewage. Process wastewaters receive pH neutralization in a 6,000 gallon tank by manually adding a caustic solution. Caustic is added to adjust the pH to neutral or slightly greater than neutral. Process wastewaters and sanitary sewage are combined before discharge into the interceptor.

Results--

Two consecutive 24-hour composite samples, collected at hourly intervals, were taken from the cleanout in front of the building (M-82) from October 25 through 27, 1976. Flows were determined from daily readings of the MLG&W water meter. There are no consumptive losses in this operation. Wastewater loads (Table LVIII) were determined from composite parameter concentrations and the flows from water meter readings.

The most recent water bill from MLG&W showed the monthly use to be 1.58 million gallons. This represents about 72,000 gallons per day based on 22 working days per month. Raw water during the sample period was 52,000 and 58,000 gallons per day. Company personnel indicated that production was about normal; however, lower than normal flows do not reflect this. Loads discharged during the study period may be less than normal and not representative of normal discharges.

This wastewater contains high concentrations of cyanide (average 34.8 mg/l) and heavy metals (zinc - 65 mg/l average, iron - 36 mg/l average, cadmium - 3.5 mg/l average). The WTP treatment process is not specifically designed to remove either heavy metals or cyanide.

# TABLE LVIII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MID SOUTH PLATING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CYANIDE CN-TOT MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M82 | | | 761025 | 1520 | | 20.5 | 4.9 | | | | |
| M82 | 761025 | 1530 | (C)761026 | 1510 | 0.057 | | | 155 | 166 | | 3100 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 0.058 | | | 240 | 214 | | 2000 |
| M82 | | | 761026 | 1510 | | 20.0 | 5.1 | | | 50.000 | |
| M82 | | | 761027 | 1405 | | 18.0 | 6.2 | | | 19.600 | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | IRON FE,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M82 | | | 761025 | 1520 | | | | | | |
| M82 | 761025 | 1530 | (C)761026 | 1510 | 68700 | 222 | 80 | 27600 | 738 | 1700 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 61940 | 319 | 82 | 44600 | 85 | 5320 |
| M82 | | | 761026 | 1510 | | | | | | |
| M82 | | | 761027 | 1405 | | | | | | |

************************************************** LOADINGS **************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CYANIDE CN-TOT LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M82 | 761025 | 1530 | (C)761026 | 1510 | 0.057 | 74 | 79 | 16.7* | 1 | 33 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 0.058 | 116 | 104 | | 1 | 30 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | IRON FE,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M82 | 761025 | 1530 | (C)761026 | 1510 | 0.057 | 0 | 0 | 13 | 0 | 1 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 0.058 | 0 | 0 | 22 | 0 | 3 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CYANIDE CN-TOT KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M82 | 761025 | 1530 | (C)761026 | 1510 | 0.057 | 33 | 36 | | 1 | 15 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 0.058 | 53 | 47 | | 0 | 14 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | IRON FE,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M82 | 761025 | 1530 | (C)761026 | 1510 | 0.057 | 0 | 0 | 6 | 0 | 0 |
| M82 | 761026 | 1500 | (C)761027 | 1400 | 0.058 | 0 | 0 | 10 | 0 | 1 |

*APPROXIMATION OF LOAD (CALCULATED WITH AVERAGE OF DAILY CONCENTRATIONS AND AVERAGE DAILY FLOW)

## Armour Corporation--

### Introduction--

Armour is a slaughtering and meat packing operation located at 1337 Riverside. They employ 475 people in a five day per week, 24-hour per day operation.

This operation consists of slaughtering (7 a.m. - 3:30 p.m.), processing (3:30 - 11:00), then cleanup (11:00 p.m. - 7:00 a.m.). Products include fresh beef and pork and processed meats (franks, bologna, sausage, and hams.)

### Wastewater Discharges and Pretreatment Processes--

Cooling waters and sanitary wastes are discharged directly into the city sewer. Process wastes, including slaughtering and cleanup wastewaters, are discharged to the pretreatment system. Wastewaters from the hog slaughtering operation result from scald tank and dehairing processes. A negligible amount of wastewater is generated by the polishing unit. Wastewaters from cattle slaughtering are generated at the head washing unit, washing tray, and the wash cabinet (100 gpm). The remainder of the wastewater is generated in the cleanup operation.

Pretreatment consists of grit removal and settling. Wastewaters flow through a grit cyclone unit into a settling tank. Solids from the settling tank are recycled to the influent of the cyclone unit to recapture the greatest possible portion of this marketable product. Floatables are skimmed off and pumped to the tank house to be marketed out. Overflow effluent is discharged through a parabolic open flow nozzle.

**Results--**

Sampling consisted of two consecutive 24-hour composites taken during the period of October 26 through 28, 1976. Samples were taken at 20-minute intervals at the stilling basin (M-83) just upstream of the company's parabolic flume. Flow was determined from daily readings of the company's totalizer: 548,000 gpd on the first day, 490,000 gpd on the second day. Analytical results of the composite samples are given in Table LIX. Company personnel indicated that operations were normal during the investigation, and thus the loadings were assumed to be representative of typical discharges.

This facility, located on the Presidents Island interceptor, is a major discharger with respect to $BOD_5$, COD, TSS, TKN, and oil and grease. If this wastewater had discharged into the WTP during the study, it would represent greater than four percent of the total influent $BOD_5$, TSS, COD, and TKN, and more than ten percent of the oil and grease. The facility plans to discontinue slaughtering at this site and correspondingly, future loadings should be in the range of normal sanitary sewage.

# TABLE LIX
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
ARMOUR
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | TOT KJEL N MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 0.548 | | | 2131.0 | 1250 | 126.00 |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 0.490 | | | 2082.0 | 1245 | 91.50 |
| M83 | | | 761027 | 0825 | | 26.0 | 6.2 | | | |
| M83 | | | 761028 | 0823 | | 30.0 | 6.2 | | | |

| STATION | DATE | TIME | DATE | TIME | NH3-N TOTAL MG/L | NO2&NO3 N-TOTAL MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 32.50 | 0.05 | 26.200 | 4390 | |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 19.50 | 0.12 | 24.800 | 3252 | |
| M83 | | | 761027 | 0825 | | | | | 348.00 |
| M83 | | | 761028 | 0823 | | | | | 223.00 |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | NH3-N TOTAL LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 0.548 | 9745.5 | 5717 | 576.23 | 148.63 |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 0.490 | 8513.7 | 5091 | 374.16 | 79.74 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 0.548 | 0.23 | 119.818 | 20076 | 1236* |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 0.490 | 0.49 | 101.412 | 13298 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | NH3-N TOTAL KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 0.548 | 4420.5 | 2593 | 261.37 | 67.42 |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 0.490 | 3861.8 | 2309 | 169.72 | 36.17 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M83 | 761026 | 0830 | (C)761027 | 0810 | 0.548 | 0.10 | 54.349 | 9107 | |
| M83 | 761027 | 0820 | (C)761028 | 0820 | 0.490 | 0.22 | 46.000 | 6032 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

### Memphis Butchers (Subsidiary of Buring Food Group, Inc.)--

#### Introduction--

Memphis Butchers is a slaughtering and processing facility located at 1186 Riverside Drive. They employ 61 people in a five day per week, eight hour per day operation, with six additional people on a second shift cleanup force.

The facility slaughters 20 hogs and 90 cattle daily. Hogs are processed into sausage, and the beef is deboned before marketing.

#### Wastewater Discharges and Pretreatment Processes--

Wastewater is generated from the post slaughtering process units, the cleanup operation, and cooling and compressor units. Sanitary wastewater is discharged directly into the city sewer. Pretreatment consists of two grease sumps.

#### Results--

Three 13-14 hour composite samples were collected at half-hour intervals during production periods from October 25 through 28, 1976. The sampling site (M-84) was a manhole on the west side of the facility. Flows were determined from daily MLG&W water meter readings minus the domestic usage (2,310 gpd). Company records indicate that the average monthly water use was 379,300 cf based upon the past four months. This equates to a daily water usage of 131,961 gpd. Daily water usage during the study ranged from 73,363 to 103,066 gpd, considerably less than the expected normal usage. Company personnel indicated that production was about normal; however, lower than normal flows do not reflect this condition. Loads discharged during the study period may be less than normal and may not be representative of normal discharges. Analytical results are presented in Table LX. Wastewater from this facility is discharged into the Presidents Island interceptor.

Average $BOD_5$, COD, TSS, and nutrient concentrations were higher than the average WTP influent wastewater concentrations. However, this facility's wastewater is amenable to biological treatment, and should not detrimentally affect the contact stabilization process used at the WTP when the interceptor goes on-line.

TABLE LX
ANALYTICAL RESULTS AND WASTEWATER LOADINGS
MEMPHIS BUTCHERS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | TOT KJEL N MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 0.071 | | | 2900.0 | 1350 | 134.00 |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 0.074 | | | 380.0 | 80 | 38.50 |
| MB4 | | | 761026 | 0955 | | 18.0 | 6.7 | 230.0 | 25 | 24.90 |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 0.101 | | | 999.0 | 480 | 74.50 |
| MB4 | | | 761027 | 0920 | | 23.0 | 6.9 | | | |
| MB4 | | | 761028 | 0935 | | 20.0 | 7.2 | | | |

| STATION | DATE | TIME | DATE | TIME | NH3-N TOTAL MG/L | NO2&NO3 N-TOTAL MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 30.00 | 0.12 | 17.300 | 4187 | |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 7.50 | 0.03 | 13.800 | 691 | |
| MB4 | | | 761026 | 0955 | 4.50 | 0.06 | 3.300 | 173 | 6.00 |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 20.00 | 0.07 | 22.400 | 2074 | |
| MB4 | | | 761027 | 0920 | | | | | 315.00 |
| MB4 | | | 761028 | 0935 | | | | | 236.00 |

************************************************ LOADINGS ************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | NH3-N TOTAL LB/D |
|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 0.071 | 1719.5 | 800 | 79.45 | 17.79 |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 0.074 | 235.9 | 50 | 23.90 | 4.66 |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 0.101 | 840.0 | 404 | 62.64 | 16.82 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 0.071 | 0.07 | 10.258 | 2483 | 127* |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 0.074 | 0.02 | 8.566 | 429 | |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 0.101 | 0.06 | 18.836 | 1744 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | NH3-N TOTAL KG/D |
|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 0.071 | 780.0 | 363 | 36.04 | 8.07 |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 0.074 | 107.0 | 23 | 10.84 | 2.11 |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 0.101 | 381.0 | 183 | 28.42 | 7.63 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| MB4 | 761025 | 1010 | (C)761025 | 2400 | 0.071 | 0.03 | 4.653 | 1126 | |
| MB4 | 761026 | 0940 | (C)761027 | 0100 | 0.074 | 0.01 | 3.885 | 195 | |
| MB4 | 761027 | 0910 | (C)761028 | 0100 | 0.101 | 0.03 | 8.544 | 791 | |

*** APPROXIMATION OF LOAD CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS ANDAVG DAILY FLOW ).**

### Unarco Commercial Products (Subsidiary of Unarco Industries, Inc.)--

#### Introduction--

Unarco is a metal plating facility, located at 1132 Kansas Street, which employs 200 people in a five day per week 24-hour per day operation.

This facility metal-plates unassembled grocery cart components. Parts are metal-finished in either zinc or nickel-chrome plating lines, according to specifications. The nickel-chrome plating lines consist of the following unit process tanks in order: pre-soak; electrode cleaner; rinse; electrode acid; rinse; nickel plating; rinse; chromic acid, and rinse. The only difference between the zinc and the nickel-chrome line is the substitution of zinc as the metal source.

#### Wastewater Discharges and Pretreatment Processes--

The majority of the wastewater is generated from the continuous overflow rinse tanks in the zinc and nickel-chrome lines. The remainder of the total wastewater is from in-plant usages (boiler, etc.) Sanitary wastes are discharged from a separate line into the city sewer. The facility provides no pretreatment for their wastewaters, but they have plans to do so in the future. The treatment scheme has not yet been developed.

#### Results--

Sampling consists of two consecutive 24-hour composites taken during the period of October 25 through 27. Samples were pumped at half-hour intervals from the cleanout (M-85) at the front of the building. Wastewater flow at this site was determined from the company's average monthly water usage and not from daily water meter readings, since the meters were submerged in the meter manhole. Company records indicate an average monthly usage of 215,200 cubic feet based on five previous months, this equates to an average daily usage of 73,230 gpd. This flow, minus the estimated sanitary waste (6,000 gpd) gives the flow (67,230 gpd) used in the loading computation. Operation during the sampling period was considered normal. Wastewater discharge loads are given in Table LXI.

This facility is probably the most significant source of chromium and nickel discharging into the Presidents Island interceptor, averaging 23.0 lbs/day of chromium and 5.12 lbs/day of nickel. If this facility had discharged into the WTP during the study, it would have accounted for about 95 percent of the influent chromium and about 67 percent of the influent nickel. Heavy metals are not amenable to treatment by biological treatment processes.

The facility is in the process of designing a pretreatment system.

## TABLE LXI
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
UNARCO
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CYANIDE CN-TOT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 0.067 | | | 36 | 40< | 0.001< |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 0.067 | | | 44 | 40< | |
| M85 | | | 761026 | 1132 | | 20.0 | 6.4 | | | |
| M85 | | | 761027 | 1240 | | 23.0 | 8.2 | | | 0.008 |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 38400 | 1900 | 245 | 154 | 5420 | 10< |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 43600 | 1640 | 226 | 82 | 12840 | 10< |
| M85 | | | 761026 | 1132 | | | | | | |
| M85 | | | 761027 | 1240 | | | | | | |

************************************************** LOADINGS **************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CYANIDE CN-TOT LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 0.067 | 20 | 22< | 0.001< | 22 | 1 |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 0.067 | 25 | 22< | | 24 | 1 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 0.067 | 0 | 0 | 3 | 0< |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 0.067 | 0 | 0 | 7 | 0< |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CYANIDE CN-TOT KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 0.067 | 9 | 10< | 0.000< | 10 | 0 |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 0.067 | 11 | 10< | | 11 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M85 | 761025 | 1145 | (C)761026 | 1130 | 0.067 | 0 | 0 | 1 | 0< |
| M85 | 761026 | 1130 | (C)761027 | 0100 | 0.067 | 0 | 0 | 3 | 0< |

## Nat Buring Packing (Div. of Buring Foods Group)--

### Introduction--

Nat Buring is a meat packing facility located at 1837 Harbor Avenue. They employ 293 people in a five day per week 16-hour per day operation.

Deboned beef and pork are flaked, ground, mixed, cooked, and packaged into luncheon meats. Pork slabs are flattened, brine injected, smoked, washed down, compressed, cut and packaged for sale as bacon. Deboned beef is flaked, ground, mixed, packed in dye transfer pouches, heat treated, and repackaged for sale as franks.

### Wastewater Discharges and Pretreatment Processes--

Wastewater is generated from continuous cleanup throughout the day, including product washdown after smokehouse operation, mid-morning cleanup, process water (cooking), boiler blowdown, and water wasted from the ammonia compressors. Consumptive loss is from evaporative cooling towers and product water makeup. Pretreatment consists of a sediment bucket and grease trap.

### Results--

Sampling consisted of two composites taken from the manhole on the west side of the building (M-86) during the period October 25 through 27. Samples were collected at one-half hour intervals for 11-12 hours of the production period. Flows were determined from daily MLG&W water meter readings.

Company records indicate an average monthly water usage of 1,153,900 cubic feet based upon the last four months. This equates to an approximate daily usage of 0.32-0.36 mgd.

Daily water usage during the study was 0.298 mgd the first day of sampling and 0.335 mgd the second day. Sanitary use (8,790 gpd), evaporative water loss, compressor cooling (67,800 gpd) during the eight non-processing hours, and product water (negligible) were subtracted from the daily raw water usage to determine the daily discharge. Discharge flows used in the loading computations were 0.221 mgd and 0.259 mgd, respectively.

Company personnel indicated that operations on the first day of sampling were not typical, and thus the discharge was assumed to be non-representative of average daily discharge.

This facility is on Presidents Island and does not presently discharge to the WTP. None of the parameters measured in the discharge (Table LXII) exceeded one percent of the current total influent loading; thus, the facility was considered a minor discharger.

## TABLE LXII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
NAT BURING PACKING
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | TOT KJEL N MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 0.221 | | | 420.0 | 810 | 10.80 |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 0.259 | | | 440.0 | 150 | 6.02 |
| M86 | | | 761026 | 1410 | | | | | | |
| M86 | | | 761027 | 1330 | | 24.0 | 6.8 | | | |

| STATION | DATE | TIME | DATE | TIME | NH3-N TOTAL MG/L | NO2&NO3 N-TOTAL MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 1.00 | 0.01< | 6.000 | 870 | |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 1.00 | 0.35 | 9.100 | 406 | |
| M86 | | | 761026 | 1410 | | | | | 25.00 |
| M86 | | | 761027 | 1330 | | | | | 47.00 |

*************************************************** LOADINGS ***************************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | NH3-N TOTAL LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 0.221 | 774.6 | 1494 | 19.92 | 1.84 |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 0.259 | 951.0 | 324 | 13.01 | 2.16 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 0.221 | 0.02< | 11.066 | 1605 | 16.8* |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 0.259 | 0.76 | 19.669 | 878 | |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | NH3-N TOTAL KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 0.221 | 351.4 | 678 | 9.03 | 0.84 |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 0.259 | 431.4 | 147 | 5.90 | 0.98 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M86 | 761025 | 1310 | (C)761026 | 0100 | 0.221 | 0.01< | 5.019 | 728 | |
| M86 | 761026 | 1345 | (C)761027 | 0100 | 0.259 | 0.34 | 8.922 | 398 | |

* APPROXIMATION OF LOAD (CALCULATED W/AVG OF DAILY GRAB CONCENTRATIONS AND AVG DAILY FLOW)

Faith-Memphis Plating Company--

Introduction--

The Faith-Memphis plant, located at 2511 Harbor Avenue on Presidents Island, repairs and rechromes auto bumpers. The operation has twenty-seven employees working one ten-hour shift five days per week.

The process consists of rechroming auto bumpers and includes buffing, straightening, and polishing the bumpers before the electro-plating process. The electro-plating process includes the following sequential steps: caustic rinse tank; two rinses; acid rinse tank; rinse; nickel plating tank; rinse; dead rinse; chrome plating; two cold rinses, and a hot rinse.

Wastewater Discharges and Pretreatment Processes--

The primary source of wastewater is from the rinsing steps in the plating process, with lesser volumes from sanitary sewage. All wastewater is combined at a common sump before discharging untreated into the sewerage system.

Results--

Composite samples were collected at thirty-minute intervals during the hours of operation on two consecutive days (October 25 and 26, 1976) from the above described sump (M-87).

Flows were determined from daily MLG&W water meter readings. There are no consumptive losses. Wastewater loads (Table LXIII) were determined from composite parameter concentrations and daily MLG&W water meter readings. Recent water bills from MLG&W showed that the water use for the past three months ranged from 55,000 to 60,000 gallons per day. During the sampling period, the flow ranged from 48,000 to 53,000 gallons per day.

The operation was considered normal by company personnel, and since the flows reflect this, wastewater discharges are assumed to be representative of normal operating conditions.

The chromium and nickel discharged by Faith-Memphis are not specifically treatable by biological treatment processes. If discharged into the WTP at the time of the study, this company would have accounted for about one-third of the total chromium and two-thirds of the nickel.

## TABLE LXIII
## ANALYTICAL RESULTS AND WASTEWATER LOADINGS
FAITH MEMPHIS
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 0.048 | | | 70 | 40< | 40200 |
| M87 | | | 761025 | 0940 | | 15.0 | 6.4 | | | |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 0.053 | | | 106 | 40< | 27600 |
| M87 | | | 761026 | 0830 | | | | 8 | 40< | 23600 |
| M87 | | | 761027 | 0810 | | 15.0 | 6.4 | | | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 70 | 190 | 130 | 39500 | 10< |
| M87 | | | 761025 | 0940 | | | | | |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 97 | 167 | 140 | 22800 | 10< |
| M87 | | | 761026 | 0830 | 18 | 84 | 82 | 5500 | 10< |
| M87 | | | 761027 | 0810 | | | | | |

******************************************** LOADINGS ********************************************

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 0.048 | 28 | 16< | 16 | 0 |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 0.053 | 47 | 18< | 12 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 0.048 | 0 | 0 | 16 | 0 |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 0.053 | 0 | 0 | 10 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 0.048 | 13 | 7< | 7 | 0 |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 0.053 | 21 | 8< | 6 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|
| M87 | 761025 | 0930 | (C)761025 | 1730 | 0.048 | 0 | 0 | 7 | 0 |
| M87 | 761026 | 0800 | (C)761026 | 1700 | 0.053 | 0 | 0 | 5 | 0 |

### Miller Transporters, Inc.--

#### Introduction--

Miller Transporters, located at 2000 Channel Avenue on Presidents Island, is a liquid transporter terminal and operates continuously. Fifty employees over three shifts constitute the normal staff at the facility.

The process includes cleaning operations (interior and exterior) of tank trucks as well as maintenance and repair. Cleaning is accomplished by using steam, hot water, and detergents; solvents are not normally used. Mild caustics may be used occasionally. Tank trucks containing poisons or insecticides are not cleaned at this location.

#### Wastewater Discharges and Pretreatment Processes--

All wastewater, except sanitary sewage, flows into a sump before discharge without treatment into the city sewerage system. Sanitary sewage discharges separately.

#### Results--

Two consecutive 24-hour composite samples, composited at hourly intervals, were collected from the above described sump (M-88) on October 25 through 27, 1976. Flows were determined by using the MLG&W water meter and subtracting the estimated volume of sanitary sewage, which is discharged separately. Wastewater loads (Table LXIV) are based on the calculated flows and composite parameter concentrations.

The most recent water bills show the average daily use, based on a six day work week, was about 23,000 gallons per day. Raw water into the facility during the sampling period was 22,000 and 28,000 gallons per day. Company personnel indicated that operation was normal at this time.

Since the operation was considered normal during the study, the waste loads discharged are assumed to be representative of normal discharge. During the sampling period, the wastewater was generally compatible with the contact stabilization process at the WTP. The heavy metal concentrations were low enough not to inhibit biological waste treatment. If the cleaning operation remains the same, and tank trucks containing toxics (pesticides, etc.) are not cleaned at this location, the wastewaters from Miller should not detrimentally affect the WTP's operation.

# TABLE LXIV
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
## MILLER TRANSPORTERS
## MEMPHIS, TN
## OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | PHENOLS TOTAL UG/L | RESIDUE TOT NFLT MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | | | 666.0< | | 415 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | | | 666.0< | | 438 |
| M88 | | | 761026 | 1415 | | 18.0 | 7.2 | | 10< | |
| M88 | | | 761027 | 1315 | | 15.5 | 8.2 | | | |

| STATION | DATE | TIME | DATE | TIME | TOT KJEL N MG/L | NH3-N TOTAL MG/L | NO2&NO3 N-TOTAL MG/L | PHOS-TOT MG/L P | COD HI LEVEL MG/L | OIL-GRSE FREON-GR MG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 62.80 | 35.00 | 0.42 | 10.900 | 650 | |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 7.00 | 6.50 | 0.50 | 40.000 | 2338 | |
| M88 | | | 761026 | 1415 | | | | | | 28.00 |
| M88 | | | 761027 | 1315 | | | | | | 250.00 |

| STATION | DATE | TIME | DATE | TIME | CHROMIUM CR,TOT UG/L | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 268 | 140 | 360 | 205 | 20< | 10< |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 102 | 343 | 290 | 415 | 29 | 10 |
| M88 | | | 761026 | 1415 | | | | | | |
| M88 | | | 761027 | 1315 | | | | | | |

## LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | PHENOLS TOTAL LB/D | RESIDUE TOT NFLT LB/D | TOT KJEL N LB/D | NH3-N TOTAL LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 116.7< | | 73 | 11.01 | 6.13 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 150.1< | | 99 | 1.58 | 1.46 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL LB/D | PHOS-TOT LB/D | COD HI LEVEL LB/D | OIL-GRSE FREON-GR LB/D | CHROMIUM CR,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 0.07 | 1.910 | 114 | | 0 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 0.11 | 9.013 | 527 | 5-50* | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT LB/D | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 0 | 0 | 0 | 0 | 0 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 0 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | PHENOLS TOTAL KG/D | RESIDUE TOT NFLT KG/D | TOT KJEL N KG/D | NH3-N TOTAL KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 52.9< | | 33 | 4.99 | 2.78 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 68.1< | | 45 | 0.72 | 0.66 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | NO2&NO3 N-TOTAL KG/D | PHOS-TOT KG/D | COD HI LEVEL KG/D | OIL-GRSE FREON-GR KG/D | CHROMIUM CR,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 0.03 | 0.866 | 52 | | 0 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 0.05 | 4.088 | 239 | | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | ZINC ZN,TOT KG/D | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M88 | 761025 | 1400 | (C)761026 | 1400 | 0.021 | 0 | 0 | 0 | 0 | 0 |
| M88 | 761026 | 1400 | (C)761027 | 1345 | 0.027 | 0 | 0 | 0 | 0 | 0 |

* APPROXIMATION, i.e. LOADS CALCULATED WITH INSTANTANEOUS GRABS AND AVERAGE DAILY DISCHARGE FLOWS

### CBI Nuclear Corporation--

### Introduction--

CBI is located at 2700 Channel Avenue on Presidents Island, and manufactures nuclear reactor pressure vessels. Operation is continuous five days per week, with approximately 400 employees.

Flat plate steel is formed and welded into cylinders; hemispherical sections are formed and welded to form vessel heads. Internals such as pumps, fuel gauges, etc., are installed in some units. X-raying and ultrasonic and pressure testing are conducted on the vessels.

### Wastewater Discharges and Pretreatment Processes--

The bulk of the wastewater discharged is from vessel washwater and hydroblasting water; X-ray rinse water and sanitary wastewater contribute a minor volume. All wastewater discharges through a common sewer into the Presidents Island sewer. Compressor water is discharged directly to McKellar Lake.

### Results--

Two consecutive 24-hour composite samples of the wastewater discharge, collected at twenty minute intervals, were obtained from a cleanout (M-89) prior to discharge into the city sewer from October 25 through 27, 1976. Flows were determined from daily MLG&W water meter readings less the volume of compressor cooling water discharged. However, two of the six compressor flowmeters were not working, and company personnel estimated the flow-through of these two compressors to be approximately the flow through either of the other two units. Therefore, discharge flows are estimates, not measurements.

Wastewater loads (Table LXV) were calculated from composite parameter concentrations and estimated flow. Flows determined the first sampling day were about twice the flow during the second day. This apparently is not unusual because of the large volumes of water used in hydroblasting or washing vessels. These operations do not occur each day.

Recent monthly flows at the facility based on the MLG&W water bills averaged about 280,000 gallons per day. This average is slightly greater than the flows determined during the sampling period; however, operations have been similar to those at the time of sampling for the past several months. The discharges determined during the sampling period should be considered representative of recent operations and not of full production capacity.

This discharger's wastewater is compatible with the contact stabilization process; the low concentrations and loads relegate it to a minor contributor status.

# TABLE LXV
# ANALYTICAL RESULTS AND WASTEWATER LOADINGS
CBI NUCLEAR
MEMPHIS, TN
OCTOBER, 1976

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | WATER TEMP CENT | PH SU | BOD 5 DAY MG/L | RESIDUE TOT NFLT MG/L | COD HI LEVEL MG/L | CHROMIUM CR,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 0.113 | | | 666.0< | 130 | 194 | 50< |
| M89 | | | 761026 | 1245 | | 16.0 | 8.4 | | | | |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 0.031 | | | 666.0< | 102 | 194 | 68 |
| M89 | | | 761027 | 1400 | | 19.0 | 7.8 | | | | |

| STATION | DATE | TIME | DATE | TIME | ZINC ZN,TOT UG/L | COPPER CU,TOT UG/L | LEAD PB,TOT UG/L | NICKEL NI,TOTAL UG/L | CADMIUM CD,TOT UG/L | SILVER AG,TOT UG/L |
|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 230 | 135 | 80< | 65 | 10< | 20< |
| M89 | | | 761026 | 1245 | | | | | | |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 193 | 142 | 80< | 20 | 10< | 66 |
| M89 | | | 761027 | 1400 | | | | | | |

## LOADINGS

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY LB/D | RESIDUE TOT NFLT LB/D | COD HI LEVEL LB/D | CHROMIUM CR,TOT LB/D | ZINC ZN,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 0.113 | 628.1< | 123 | 183 | 0 | 0 |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 0.031 | 172.3< | 26 | 50 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT LB/D | LEAD PB,TOT LB/D | NICKEL NI,TOTAL LB/D | CADMIUM CD,TOT LB/D | SILVER AG,TOT LB/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 0.113 | 0 | 0 | 0 | 0 | 0 |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 0.031 | 0 | 0 | 0 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | BOD 5 DAY KG/D | RESIDUE TOT NFLT KG/D | COD HI LEVEL KG/D | CHROMIUM CR,TOT KG/D | ZINC ZN,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 0.113 | 284.9< | 56 | 83 | 0 | 0 |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 0.031 | 78.2< | 12 | 23 | 0 | 0 |

| STATION | DATE | TIME | DATE | TIME | CONDUIT FLOW MGD | COPPER CU,TOT KG/D | LEAD PB,TOT KG/D | NICKEL NI,TOTAL KG/D | CADMIUM CD,TOT KG/D | SILVER AG,TOT KG/D |
|---|---|---|---|---|---|---|---|---|---|---|
| M89 | 761025 | 1300 | (C)761026 | 1400 | 0.113 | 0 | 0 | 0 | 0 | 0 |
| M89 | 761026 | 1400 | (C)761027 | 1400 | 0.031 | 0 | 0 | 0 | 0 | 0 |

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# APPENDIX A

## LABORATORY DATA

APPENDIX A
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

INFLUENT

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | BOD$_5$ mg/1 | COD mg/1 | TOTAL SOLIDS mg/1 | TOTAL VOLATILE SOLIDS mg/1 | TOTAL SUSPENDED SOLIDS mg/1 | TOTAL VOLATILE SUSPENDED SOLIDS mg/1 | TKN-N mg/1 | NH$_3$-N mg/1 | NO$_3$-NO$_2$-N mg/1 | TOTAL PHOSPHORUS mg/1 | Pb ug/1 | Cr ug/1 | Cu ug/1 | Cd ug/1 | Zn ug/1 | OIL & GREASE mg/1 | PHENOLS mg/1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1214 | Max I | 10 | 19 | 76 | 0940 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 38 | — |
| 1215 | | 10 | 18/19 | 76 | 24-hr Comp. | 505 | 928 | 726 | 262 | 247 | 160 | 33.7 | 17.5 | 0.05 | 24 | 100 | 60 | 115 | <10 | 260 | — | — |
| 1278 | | 10 | 19/20 | 76 | 24-hr Comp. | 620 | 996 | 800 | 400 | 262 | 182 | 33 | 17.5 | 0.01 | 15.5 | 165 | 121 | 116 | <10 | 263 | — | — |
| 1292 | | 10 | 20 | 76 | 1100 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 27 | — |
| 1314 | | 10 | 20/21 | 76 | 24-hr Comp. | 540 | 1114 | 918 | 497 | 282 | 208 | 37.3 | 15 | 0.01 | 12.2 | 125 | <50 | 92 | <10 | 241 | — | — |
| 1315 | | 10 | 21 | 76 | | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 1318 | | 10 | 21 | 76 | 0850 | >1200 | 2442 | 1242 | 903 | 803 | 750 | 21.5 | 5.0 | 0.01 | 10.9 | <80 | <50 | 83 | <10 | 166 | 606 | — |
| 1390 | | 10 | 21/22 | 76 | 24-hr Comp. | 673 | 1212 | 992 | 544 | 480 | 347 | 31 | 5.0 | 0.01 | 11.3 | 215 | 53 | 111 | <10 | 256 | — | — |
| 1391 | | 10 | 22 | 76 | 0930 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 18 | 540 |
| 1392 | | 10 | 22/23 | 76 | 24-hr Comp. | 684 | 1083 | 1010 | 454 | 450 | 331 | 36.2 | 9.0 | 0.01 | 13.4 | 180 | 67 | 123 | <10 | 309 | — | — |
| 1393 | | 10 | 23 | 76 | 0930 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 30 | 600 |
| 1394 | | 10 | 23/24 | 76 | 24-hr Comp. | 460 | 948 | 814 | 412 | 420 | 307 | 28.0 | 11 | <0.01 | 18.8 | 140 | <50 | 119 | <10 | 268 | — | — |
| 1395 | | 10 | 24 | 76 | 0930 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 27 | 400 |
| 1396 | | 10 | 24/25 | 76 | 24-hr Comp. | 250 | 605 | 928 | 428 | 547 | 240 | 24.4 | 7.5 | 0.01 | 9.3 | 121 | 53 | 92 | <10 | 237 | — | — |
| 1397 | | 10 | 25 | 76 | 0810 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 34 | <10 |

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

EFFLUENT

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | BOD$_5$ mg/l | COD mg/l | TOTAL SOLIDS mg/l | TOTAL VOLATILE SOLIDS mg/l | SUSPENDED SOLIDS mg/l | VOLATILE SUSPENDED SOLIDS mg/l | TKN-N mg/l | NH$_3$-N mg/l | NO$_3$-NO$_2$-N mg/l | TOTAL PHOSPHORUS mg/l | Pb ug/l | Cr ug/l | Cu ug/l | Cd ug/l | Zn ug/l | OIL & GREASE mg/l | TURBIDITY NTU | TURBIDITY @ 30 MIN NTU | PHENOLS mg/l | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1240 | MAX E | 10 | 18/19 | 76 | 24-hr Comp. | 63 | 179 | 462 | 108 | 64 | 44 | 26.8 | 18.5 | <0.01 | 17.2 | <80 | <50 | 31 | <10 | 73 | — | — | — | — | | |
| 1241 | | 10 | 19 | 76 | 0940 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | <5 | — | — | — | | |
| 1265 | | 10 | 19 | 76 | 1510 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 19 | — | — | | |
| 1276 | | 10 | 20 | 76 | 0900 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 32 | 25 | — | | |
| 1277 | | 10 | 19/20 | 76 | 24-hr Comp. | 94 | 207 | 488 | 116 | 64 | 33 | 19.4 | 16.0 | <0.01 | 19.2 | 85 | <50 | 41 | <10 | 70 | — | — | — | — | | |
| 1293 | | 10 | 20 | 76 | 1115 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | — | — | | |
| 1314 | | 10 | 20 | 76 | 1400 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 70 | — | — | | |
| 1316 | | 10 | 20/21 | 76 | 24-hr Comp. | 130 | 326 | 546 | 214 | 125 | 83 | 266 | 18.0 | <0.01 | 9.6 | <80 | <50 | 50 | <10 | 115 | — | — | — | — | | |
| 1317 | | 10 | 21 | 76 | | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | | |
| 1324 | | 10 | 21 | 76 | 0852 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 21 | — | — | | |
| 1398 | | 10 | 21/22 | 76 | 24-hr Comp. | 180 | 583 | 696 | 280 | 280 | 190 | 26.8 | 12.5 | <0.01 | 8.9 | 180 | <50 | 81 | <10 | 175 | — | — | — | — | | |
| 1399 | | 10 | 22 | 76 | 1000 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | <5 | — | — | <10 | | |
| 1400 | | 10 | 22/23 | 76 | 24-hr Comp. | 270 | 769 | 924 | 472 | 480 | 337 | 32.0 | 13.2 | <0.01 | 11.6 | 158 | 63 | 121 | <10 | 276 | — | — | — | — | | |
| 1401 | | 10 | 23 | 76 | 0942 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 19 | — | — | <10 | | |
| 1402 | | 10 | 23/24 | 76 | 24-hr Comp. | 300 | 798 | 802 | 344 | 356 | 256 | 323 | 16.0 | <0.01 | 15.9 | 145 | 58 | 133 | <10 | 301 | — | — | — | — | | |
| 1403 | | 10 | 24 | 76 | 0950 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 7 | — | — | <10 | | |
| 1404 | | 10 | 24/25 | 76 | 24-hr Comp. | 120 | 279 | 376 | 134 | 100 | 60 | 12.4 | 5.5 | <0.01 | 7.4 | <80 | <50 | 60 | <10 | 131 | — | — | — | — | | |
| 1405 | | 10 | 25 | 76 | 0825 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | — | <10 | | |

A-2

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

CONTACT BASINS

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | TOTAL SUSPENDED SOLIDS mg/l | VOLATILE SUSPENDED SOLIDS mg/l | % SOLIDS V/V Centrifuge | SETTLOMETER | | | | | | | | | | # COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 5 min | 10 min | 15 min | 20 min | 25 min | 30 min | 40 min | 50 min | 60 min | 120 min | |
| 1193 | S-2 | 10 | 18 | 76 | 1115 | 2,067 | 1,500 | 6.0 | 85 | 60 | 53 | 48 | 44 | 40 | 37 | 35 | 31 | — | Supernatant TURBID with light Colored Floc |
| 1195 | | 10 | 18 | 76 | 1600 | 1,500 | 1,033 | 5.0 | 60 | 50 | 45 | 41 | 40 | 37 | 30 | — | — | — | TURBID Supernatant |
| 1242 | | 10 | 19 | 76 | 1030 | 2,300 | 1,667 | 7.0 | 93 | 85 | 74 | 64 | 57 | 53 | 51 | 47 | 42 | 31 | Fluffy Light gray Colored Solids-Super Turbid |
| 1261 | | 10 | 19 | 76 | 1455 | — | — | 4.5 | 90 | 85 | 80 | 79 | 78 | 77 | 74 | 70 | 70 | — | TURBID Supernatant-Fluffy Solids |
| 1269 | | 10 | 20 | 76 | 0845 | 1,733 | 1,167 | 4.5 | 63 | 52 | 48 | 44 | 41 | 38 | 35 | 30 | 28 | 18 | TURBID Supernatant-Rise of Solids @ 2 hrs. |
| 1294 | | 10 | 20 | 76 | 1330 | 2,000 | 1,333 | 5.0 | 80 | 67 | 60 | 55 | 50 | 48 | 44 | 40 | 36 | — | 31 @ 90 min TURBID Supernatant |
| 1359 | | 10 | 21 | 76 | 0940 | 2,915 | 2,238 | 7.5 | 95 | 90 | 87 | 75 | 70 | 65 | 60 | 55 | 50 | — | Supernatant clear @ 5 min - Turbid @ 30 min |
| 1388 | | 10 | 23 | 76 | 1000 | 2,933 | 2,333 | — | 90 | 85 | 85 | 78 | — | 70 | — | 60 | 43 | 35 | — — — — — — — — |
| 1194 | N-2 | 10 | 18 | 76 | 1116 | 1,584 | 1,086 | 4.0 | 55 | 40 | 37 | 32 | 30 | 30 | 26 | 25 | 23 | — | Supernatant Turbid - Light colored Floc |
| 1202 | | 10 | 18 | 76 | 1457 | 1,300 | 900 | 5.0 | 57 | 45 | 39 | 35 | 34 | 31 | 29 | — | — | — | Turbid Supernatant |
| 1265 | | 10 | 19 | 76 | 1030 | 2,029 | 1,488 | 6.0 | 90 | 75 | 66 | 59 | 54 | 49 | 46 | 41 | 38 | 27 | Fluffy Light gray solids-Supernatant Turbid |
| 1262 | | 10 | 19 | 76 | 1455 | — | — | 4.5 | 90 | 92 | 80 | 78 | 75 | 74 | 70 | 70 | 65 | — | Turbid Supernatant-Fluffy Solids |
| 1270 | | 10 | 20 | 76 | 0845 | 1,667 | 1,033 | 5.0 | 58 | 48 | 45 | 41 | 40 | 37 | 35 | 32 | 30 | 20 | Turbid Supernatant-Rise of Solids @ 2 hrs |
| 1295 | | 10 | 20 | 76 | 1330 | 1,800 | 1,200 | 5.2 | 81 | 72 | 67 | 61 | 59 | 54 | 50 | 44 | 40 | — | 35 @ 90 min. Turbid Supernatant |
| 1354 | | 10 | 21 | 76 | 0945 | 2,467 | 1,933 | 7.0 | 95 | 84 | 73 | 65 | 60 | 57 | 53 | 48 | 45 | — | Turbid Supernatant-Fluffy Solids |
| 1389 | | 10 | 23 | 76 | 1005 | 2,733 | 2,100 | — | 85 | 75 | 70 | 60 | — | 55 | — | 50 | 53 | 30 | — — — — — — — — |

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

REAERATION BASINS

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | TOTAL SUSPENDED SOLIDS mg/l | VOLATILE SUSPENDED SOLIDS mg/l | % SOLIDS V/V CENTRIFUGE |
|---|---|---|---|---|---|---|---|---|
| 1196 | S-6 | 10 | 18 | 76 | 1455 | 5,550 | 4,050 | 20 |
| 1254 |  | 10 | 19 | 76 | 1100 | 6,150 | 4,500 | 17 |
| 1280 |  | 10 | 20 | 76 | 0945 | 6,000 | 4,400 | 18 |
| 1297 |  | 10 | 20 | 76 | 1340 | 6,600 | 4,900 | 20 |
| 1361 |  | 10 | 21 | 76 | 0920 | 7,700 | 5,850 | 19 |
| 1279 | S-6 | 10 | 20 | 76 | 0940 | 6,016 | 4,850 | 20 |
| 1296 |  | 10 | 20 | 76 | 1342 | 6,600 | 4,967 | 18 |
| 1360 |  | 10 | 21 | 76 | 0917 | 8,233 | 6,300 | 20 |
| 1203 | N-6 | 10 | 18 | 76 | 1650 | 4,600 | 3,550 | 17 |
| 1257 |  | 10 | 19 | 76 | 1115 | 5,650 | 4,300 | 18 |
| 1288 |  | 10 | 20 | 76 | 0945 | 5,900 | 4,400 | 19 |
| 1300 |  | 10 | 20 | 76 | 1330 | 5,800 | 4,350 | 20 |
| 1355 |  | 10 | 21 | 76 | 0938 | 7,050 | 5,400 | 18 |
| 1208 | N-10 | 10 | 18 | 76 | 1433 | 4,400 | 3,300 | 15 |
| 1258 |  | 10 | 19 | 76 | 1112 | 5,300 | 4,050 | 17 |
| 1299 |  | 10 | 20 | 76 | 1003 | 5,500 | 4,100 | 19 |
| 1301 |  | 10 | 20 | 76 | 1330 | 5,700 | 4,250 | 20 |
| 1356 |  | 10 | 21 | 76 | 0935 | 6,450 | 4,950 | 17 |

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

DIGESTERS

| OTM SAD # | STATION | MONTH | DAY | YEAR | TIME | TOTAL SUSPENDED SOLIDS mg/1 | VOLATILE SUSPENDED SOLIDS mg/1 | % SOLIDS V/V CENTRIFUGE |
|---|---|---|---|---|---|---|---|---|
| 1197 | S-12 | 10 | 18 | 76 | 1430 | 6,550 | 3,850 | 20 |
| 1255 | | 10 | 19 | 76 | 1103 | 6,700 | 3,950 | 15 |
| 1281 | | 10 | 20 | 76 | 0945 | 6,300 | 3,750 | 15 |
| 1298 | | 10 | 20 | 76 | 1337 | 6,450 | 3,850 | 15 |
| 1362 | | 10 | 21 | 76 | 0925 | 6,350 | 3,800 | 13 |
| 1198 | S-13 | 10 | 18 | 76 | 1442 | 6,300 | 3,900 | 20 |
| 1256 | | 10 | 19 | 76 | 1105 | 6,500 | 3,950 | 15 |
| 1282 | | 10 | 20 | 76 | 0947 | 6,650 | 4,050 | 17 |
| 1299 | | 10 | 20 | 76 | 1335 | 6,600 | 3,900 | 17 |
| 1363 | | 10 | 21 | 76 | 0922 | 6,300 | 3,800 | 16.5 |
| 1204 | N-12 | 10 | 18 | 76 | 1445 | 5,000 | 3,150 | 16 |
| 1259 | | 10 | 19 | 76 | 1110 | 5,050 | 3,400 | 13 |
| 1290 | | 10 | 20 | 76 | 0953 | 5,100 | 3,400 | 15 |
| 1302 | | 10 | 20 | 76 | 1330 | 5,300 | 3,350 | 16 |
| 1357 | | 10 | 21 | 76 | 0930 | 4,900 | 3,150 | 12 |
| 1205 | N-13 | 10 | 18 | 76 | 1440 | 4,950 | 3,350 | 16 |
| 1260 | | 10 | 19 | 76 | 1108 | 5,200 | 3,600 | 16 |
| 1291 | | 10 | 20 | 76 | 0957 | 5,300 | 3,750 | 15 |
| 1303 | | 10 | 20 | 76 | 1330 | 5,150 | 3,650 | 13 |
| 1358 | | 10 | 21 | 76 | 0933 | 4,800 | 3,250 | 12 |

A-5

## APPENDIX A (CONTINUED)
## LABORATORY DATA
## T.E. MAXSON "SOUTH" WTP
## MEMPHIS, TN

RETURN SLUDGE

| OIM SAD # | STATION | MONTH | DAY | YEAR | TIME | TOTAL SUSPENDED SOLIDS mg/l | VOLATILE SUSPENDED SOLIDS mg/l | % SOLIDS V/V CENTRIFUGE |
|---|---|---|---|---|---|---|---|---|
| 1199 | 2RS-S | 10 | 18 | 76 | 1412 | 5,625 | 4,375 | 20 |
| 1243 | | 10 | 19 | 76 | 1015 | 6,750 | 5,050 | 18 |
| 1283 | | 10 | 20 | 76 | 1000 | 7,750 | 5,800 | 15 |
| 1304 | | 10 | 20 | 76 | 1343 | 7,250 | 5,550 | 23 |
| 1325 | | 10 | 21 | 76 | 0907 | 8,800 | 6,850 | 26 |
| 1200 | 3RS-S | 10 | 18 | 76 | 1410 | 6,000 | 4,750 | 23 |
| 1244 | | 10 | 19 | 76 | 1015 | 6,450 | 5,000 | 18 |
| 1284 | | 10 | 20 | 76 | 0955 | 7,700 | 6,000 | 23 |
| 1305 | | 10 | 20 | 76 | 1340 | 7,300 | 5,600 | 22 |
| 1326 | | 10 | 21 | 76 | 0903 | 8,000 | 6,100 | 25 |
| 1201 | 4RS-S | 10 | 18 | 76 | 1415 | 5,525 | 4,200 | 20 |
| 1248 | | 10 | 19 | 76 | 1015 | 5,250 | 3,900 | 15 |
| 1285 | | 10 | 20 | 76 | 0950 | 7,550 | 5,700 | 26 |
| 1306 | | 10 | 20 | 76 | 1332 | 7,800 | 5,800 | 23 |
| 1327 | | 10 | 21 | 76 | 0959 | 7,500 | 5,600 | 25 |
| 1206 | 2RS-N | 10 | 18 | 76 | 1417 | 4,175 | 3,125 | 17 |
| 1246 | | 10 | 19 | 76 | 1025 | 4,350 | 3,200 | 16 |
| 1286 | | 10 | 20 | 76 | 0945 | 6,450 | 4,650 | 24 |
| 1307 | | 10 | 20 | 76 | 1347 | 6,150 | 4,550 | 22 |
| 1328 | | 10 | 21 | 76 | 0844 | 4,600 | 3,350 | 16 |

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

RETURN SL GE & CLARIFIERS

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | TOTAL SUSPENDED SOLIDS mg/l | VOLATILE SUSPENDED SOLIDS mg/l | % SOLIDS V/V CENTRIFUGE | TURBIDITY NTU | TURBIDITY @ 30 MIN NTU |
|---|---|---|---|---|---|---|---|---|---|---|
| 1207 | 3RS-N | 10 | 18 | 76 | 1420 | 4,400 | 3,250 | 18 | — | — |
| 1247 | | 10 | 19 | 76 | 1020 | 5,550 | 4,050 | 18 | — | — |
| 1287 | | 10 | 20 | 76 | 1005 | 5,600 | 4,150 | 26 | — | — |
| 1308 | | 10 | 20 | 76 | 1353 | 6,000 | 4,400 | 20 | — | — |
| 1329 | | 10 | 21 | 76 | 0846 | 5,500 | 3950 | 18 | — | — |
| 1213 | C-25 | 10 | 18 | 76 | 1545 | — | — | — | 44 | 16 |
| 1249 | | 10 | 19 | 76 | 1005 | — | — | — | 14 | 12 |
| 1266 | | 10 | 19 | 76 | 1513 | — | — | — | 10 | — |
| 1271 | | 10 | 20 | 76 | 0900 | — | — | — | 27 | 22 |
| 1311 | | 10 | 20 | 76 | 1342 | — | — | — | 43 | — |
| 1319 | | 10 | 21 | 76 | 0910 | — | — | — | 17 | — |
| 1212 | C-35 | 10 | 18 | 76 | 1537 | — | — | — | 68 | 15 |
| 1250 | | 10 | 19 | 76 | 1005 | — | — | — | 14 | 12 |
| 1267 | | 10 | 19 | 76 | 1515 | — | — | — | 13 | — |
| 1272 | | 10 | 20 | 76 | 0900 | — | — | — | 28 | 23 |
| 1312 | | 10 | 20 | 76 | 1341 | — | — | — | 15 | — |
| 1320 | | 10 | 21 | 76 | 0858 | — | — | — | 61 | — |

APPENDIX A (CONTINUED)
LABORATORY DATA
T.E. MAXSON "SOUTH" WTP
MEMPHIS, TN

CLARIFIERS

| O+M SAD # | STATION | MONTH | DAY | YEAR | TIME | TURBIDITY NTU | TURBIDITY @ 30 min NTU |
|---|---|---|---|---|---|---|---|
| 1210 | C-4S | 10 | 18 | 76 | 1530 | 11 | 7 |
| 1251 | | 10 | 19 | 76 | 1005 | 21 | 17 |
| 1268 | | 10 | 19 | 76 | 1519 | 15 | — |
| 1273 | | 10 | 20 | 76 | 0900 | 22 | 20 |
| 1313 | | 10 | 20 | 76 | 1330 | 15 | — |
| 1321 | | 10 | 21 | 76 | 0856 | 17 | — |
| 1209 | C-2N | 10 | 18 | 76 | 1517 | 11 | 7 |
| 1252 | | 10 | 19 | 76 | 1025 | 20 | 15 |
| 1263 | | 10 | 19 | 76 | 1505 | 14 | — |
| 1274 | | 10 | 20 | 76 | 0900 | 24 | 20 |
| 1309 | | 10 | 20 | 76 | 1345 | 15 | — |
| 1322 | | 10 | 21 | 76 | 0940 | 12 | — |
| 1211 | C-3N | 10 | 18 | 76 | 1510 | 9 | 8 |
| 1253 | | 10 | 19 | 76 | 1020 | 26 | 17 |
| 1264 | | 10 | 19 | 76 | 1507 | 14 | — |
| 1275 | | 10 | 20 | 76 | 0900 | 38 | 32 |
| 1310 | | 10 | 20 | 76 | 1352 | 270 | — |
| 1323 | | 10 | 21 | 76 | 0848 | 11 | — |

## APPENDIX A (CONTINUED)
## INFLUENT COD
## T. E. MAXSON WTP

| DATE | TIME | FLOW(MGD) | COD(MG/L) | LOAD(#/DAY) |
|---|---|---|---|---|
| 10/18 | 900 | 27.4 | 720. | 164531. |
| 10/18 | 1000 | 31.6 | 729. | 192124. |
| 10/18 | 1100 | 35.5 | 810. | 239817. |
| 10/18 | 1200 | 38.5 | 824. | 264578. |
| 10/18 | 1300 | 40.9 | 960. | 327462. |
| 10/18 | 1400 | 43.7 | 898. | 327283. |
| 10/18 | 1500 | 43.4 | 927. | 335533. |
| 10/18 | 1600 | 45.2 | 979. | 369052. |
| 10/18 | 1700 | 44.9 | 786. | 294330. |
| 10/18 | 1800 | 45.3 | 773. | 292041. |
| 10/18 | 1900 | 44.6 | 765. | 284552. |
| 10/18 | 2000 | 45.2 | 839. | 316276. |
| 10/18 | 2100 | 45.1 | 810. | 304669. |
| 10/18 | 2200 | 44.6 | 825. | 306870. |
| 10/18 | 2300 | 44.7 | 755. | 281462. |
| 10/18 | 2400 | 45.1 | 777. | 292256. |
| 10/19 | 100 | 45.7 | 814. | 310246. |
| 10/19 | 200 | 45.6 | 881. | 335048. |
| 10/19 | 300 | 45.9 | 888. | 339932. |
| 10/19 | 400 | 45.5 | 1160. | 440185. |
| 10/19 | 500 | 44.6 | 1150. | 427759. |
| 10/19 | 600 | 44.4 | 1180. | 436949. |
| 10/19 | 700 | 40.5 | 1120. | 378302. |
| 10/19 | 800 | 34.6 | 873. | 251916. |
| AVERAGE | | 42.2 | 885. | 313048. |

## APPENDIX A (CONTINUED)
## INFLUENT COD
## T. E. MAXSON WTP

| DATE | TIME | FLOW(MGD) | COD(MG/L) | LOAD(#/DAY) |
|---|---|---|---|---|
| 10/20 | 900 | 40.0 | 932. | 310915. |
| 10/20 | 1000 | 40.0 | 684. | 228182. |
| 10/20 | 1100 | 40.1 | 783. | 261862. |
| 10/20 | 1200 | 42.4 | 964. | 340886. |
| 10/20 | 1300 | 42.0 | 1080. | 378302. |
| 10/20 | 1400 | 54.8 | 1300. | [illegible]94142. |
| 10/20 | 1500 | 54.5 | 869. | 394987. |
| 10/20 | 1600 | 48.3 | 972. | 391543. |
| 10/20 | 1700 | 50.1 | 956. | 399449. |
| 10/20 | 1800 | 43.8 | 892. | 325840. |
| 10/20 | 1900 | 45.0 | 1070. | 401571. |
| 10/20 | 2000 | 54.4 | 1240. | 562582. |
| 10/20 | 2100 | 46.3 | 980. | 378419. |
| 10/20 | 2200 | 43.6 | 1010. | 367260. |
| 10/20 | 2300 | 43.4 | 1010. | 365575. |
| 10/20 | 2400 | 44.1 | 1260. | 463420. |
| 10/21 | 100 | 44.4 | 980. | 362890. |
| 10/21 | 200 | 44.1 | 924. | 339842. |
| 10/21 | 300 | 43.6 | 932. | 338898. |
| 10/21 | 400 | 42.8 | 932. | 332679. |
| 10/21 | 500 | 40.6 | 741. | 250906. |
| 10/21 | 600 | 35.5 | 629. | 186228. |
| 10/21 | 700 | 31.8 | 2480. | 657726. |
| 10/21 | 800 | 31.8 | 1910. | 506555. |
| AVERAGE | | 43.6 | 1064. | 380860. |

## APPENDIX A (CONTINUED)
## INFLUENT COD
## T. E. MAXSON WTP

| DATE | TIME | FLOW(MGD) | COD(MG/L) | LOAD(#/DAY) |
|---|---|---|---|---|
| 10/22 | 900 | 30.0 | 421. | 105334. |
| 10/22 | 1000 | 32.4 | 306. | 82686. |
| 10/22 | 1100 | 35.9 | 313. | 93714. |
| 10/22 | 1200 | 43.2 | 774. | 278863. |
| 10/22 | 1300 | 43.5 | 595. | 215860. |
| 10/22 | 1400 | 43.8 | 635. | 231960. |
| 10/22 | 1500 | 44.1 | 747. | 274742. |
| 10/22 | 1600 | 45.8 | 509. | 194424. |
| 10/22 | 1700 | 38.0 | 1120. | 354950. |
| 10/22 | 1800 | 31.8 | 1370. | 363340. |
| 10/22 | 1900 | 31.8 | 1250. | 331515. |
| 10/22 | 2000 | 32.7 | 1220. | 332716. |
| 10/22 | 2100 | 39.1 | 920. | 300006. |
| 10/22 | 2200 | 32.6 | 1448. | 393688. |
| 10/22 | 2300 | 39.6 | 1038. | 342814. |
| 10/22 | 2400 | 41.5 | 1171. | 405295. |
| 10/23 | 100 | 32.8 | 1045. | 285862. |
| 10/23 | 200 | 32.4 | 1076. | 291293. |
| 10/23 | 300 | 32.8 | 1276. | 349052. |
| 10/23 | 400 | 31.3 | 1052. | 274616. |
| 10/23 | 500 | 28.3 | 807. | 190470. |
| 10/23 | 600 | 24.4 | 1237. | 251724. |
| 10/23 | 700 | 23.7 | 721. | 142511. |
| 10/23 | 800 | 22.2 | 483. | 89426. |
| AVERAGE | | 34.7 | 897. | 257369. |

# APPENDIX B

# DISSOLVED OXYGEN CONCENTRATIONS

# APPENDIX B

## T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

| STATION | DATE | TEMP CENT | DO-MG/L 1 FT | DO-MG/L 6 FT | DO-MG/L 11 FT | DO-MG/L 12 FT | DO-MG/L 15 FT | DO-MG/L 16 FT |
|---|---|---|---|---|---|---|---|---|
| **NORTH BASIN** | | | | | | | | |
| N-1A | 761018 | 25.0 | 0.1 | 0.0 | | 0.0 | | |
| N-1A | 761019 | 24.5 | 0.2 | 0.2 | | 0.1 | | |
| N-1A | 761020 | 24.0 | 0.2 | 0.1 | | | | |
| N-1A | 761023 | 25.0 | 0.3 | | 0.1 | | | |
| N-1B | 761018 | 25.0 | 0.1 | 0.0 | | 0.0 | | |
| N-1B | 761023 | 25.0 | 0.3 | | 0.0 | | | |
| N-1C | 761018 | 25.0 | 0.2 | 0.1 | | 0.2 | | |
| N-1C | 761019 | 25.0 | 0.2 | 0.2 | | 0.2 | | |
| N-1C | 761020 | 24.0 | 3.4 | 3.4 | | 3.4 | | |
| N-1C | 761023 | 25.0 | 0.2 | | 0.0 | | | |
| N-2A | 761018 | 25.0 | 0.5* | | | | | |
| N-2A | 761018 | 25.0 | 0.6 | 0.4 | | 0.0 | | |
| N-2A | 761020 | 24.0 | 4.8 | 5.2 | | 4.2 | | |
| N-2A | 761023 | 25.0 | 2.2 | | 1.8 | | | |
| N-2B | 761018 | 25.0 | 0.0 | 0.0 | | | | |
| N-2B | 761023 | 25.0 | 1.2 | | 0.7 | | | |
| N-2C | 761018 | 25.0 | 0.2 | 0.1 | | 0.2 | | |
| N-2C | 761023 | 25.0 | 0.1 | | 0.0 | | | |
| N-3A | 761023 | 25.5 | 0.2 | | 0.1 | | | |
| N-3B | 761023 | 25.5 | 0.3 | | 0.1 | | | |
| N-3C | 761023 | 25.5 | 0.2 | | 0.0 | | | |
| N-4A | 761023 | 25.5 | 0.4 | | 0.1 | | | |
| N-4B | 761023 | 25.5 | 0.3 | | 0.2 | | | |
| N-4C | 761023 | 25.5 | 0.2 | | 0.0 | | | |
| N-5A | 761018 | 25.0 | 0.2 | 0.1 | | 0.0 | | |
| N-5A | 761019 | 25.5 | 0.1 | 0.0 | | | | |
| N-5A | 761020 | 25.0 | 0.2 | | | | | |
| N-5A | 761023 | 25.0 | 1.3 | | 0.2 | | | |
| N-5B | 761018 | 26.0 | 0.5 | 0.4 | | 0.2 | | |
| N-5B | 761023 | 26.0 | 3.3 | | 3.2 | | | |
| N-5C | 761018 | 26.0 | 1.2 | 1.0 | | 1.0 | | 0.6 |
| N-5C | 761019 | | 0.1 | 0.0 | | | | |
| N-5C | 761023 | 26.0 | 4.6 | | 4.2 | | | |
| N-6A | 761018 | 26.0 | 3.3 | 3.3 | | 3.0 | | 2.7 |
| N-6A | 761019 | 26.0 | 0.6 | 0.5 | | 0.2 | | |
| N-6A | 761020 | 25.0 | 4.4 | 4.6 | | 4.4 | | |
| N-6A | 761023 | 25.0 | 7.0 | | | | | |
| N-6A | 761023 | 26.0 | | | 5.4 | | | |
| N-6B | 761018 | 26.0 | 2.4 | 2.6 | | 2.2 | | 2.0 |
| N-6B | 761023 | 24.5 | 6.3 | | 5.6 | | | |
| N-6C | 761023 | 26.0 | 5.2 | | 5.0 | | | |
| N-9A | 761018 | 25.0 | 0.3 | 0.0 | | | | |
| N-9A | 761019 | 26.0 | 0.0 | 0.0 | | | | |
| N-9A | 761020 | 25.0 | 0.1 | | | | | |
| N-9C | 761018 | 25.0 | 0.5 | 0.0 | | | | |
| N-9C | 761020 | 25.0 | 0.5 | 0.2 | | | | |

## APPENDIX B

### T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

| STATION | DATE | TEMP CENT | DO-MG/L 1 FT | DO-MG/L 6 FT | DO-MG/L 11 FT | DO-MG/L 12 FT | DO-MG/L 15 FT | DO-MG/L 16 FT |
|---|---|---|---|---|---|---|---|---|
| NORTH BASIN | | | | | | | | |
| N-10A | 761018 | 25.0 | 1.6* | | | | | |
| N-10A | 761018 | 25.0 | 1.6 | 1.5 | | 1.2 | | 0.3 |
| N-10A | 761019 | 25.0 | 0.4 | 0.4 | | 0.0 | | |
| N-10A | 761020 | 24.0 | 6.2 | 3.8 | | 3.1 | | |
| N-11A | 761018 | 26.0 | 2.0* | | | | | |
| N-11A | 761018 | 26.0 | 1.8 | 1.7 | | 1.6 | | 1.4 |
| N-11A | 761019 | 25.5 | 0.4 | 0.4 | | 0.4 | | |
| N-11A | 761020 | 25.0 | 3.2 | 3.2 | | 3.1 | | |
| N-11A | 761023 | 23.0 | 8.4 | | 8.4 | | | |
| N-11B | 761018 | 26.5 | 2.0 | 2.0 | | 1.9 | | 1.9 |
| N-11B | 761023 | 22.0 | 8.9 | | 8.9 | | | |
| N-11C | 761023 | 23.0 | 8.6 | | 8.6 | | | |
| N-12A | 761019 | 26.0 | 1.3 | 1.0 | | 1.1 | | |
| N-12A | 761020 | 25.0 | 3.2 | 3.1 | | 3.1 | | |
| N-12A | 761023 | 23.0 | 8.1 | | 8.1 | | | |
| N-12B | 761018 | 26.5 | 2.4 | 2.3 | | 2.2 | | 2.2 |
| N-12B | 761023 | 23.0 | 8.2 | | 8.2 | | | |
| N-12C | 761023 | 23.0 | 8.3 | | 8.2 | | | |
| N-13A | 761019 | 24.0 | 0.1 | | | | | |
| N-13A | 761020 | 24.0 | 3.5 | 3.4 | | 3.4 | | |
| N-13A | 761023 | 23.0 | 2.4 | | 2.2 | | | |
| N-13B | 761018 | 23.5 | 2.9 | 2.9 | | 2.8 | 2.7 | |
| N-13B | 761023 | 23.0 | 2.4 | | 2.2 | | | |
| N-13C | 761023 | 23.0 | 2.6 | | 2.4 | | | |
| N-14A | 761018 | 24.0 | 0.4* | | | | | |
| N-14A | 761018 | 24.0 | 0.6 | 0.4 | | 0.2 | | 0.0 |
| N-14A | 761019 | 24.5 | 0.3 | 0.1 | | | | |
| N-14A | 761020 | 24.0 | 3.1 | 3.1 | | 3.2 | | |
| N-14A | 761023 | 23.0 | 0.6 | | 0.4 | | | |
| N-14B | 761023 | 23.0 | 1.0 | | 0.9 | | | |
| N-14C | 761018 | 24.0 | 1.0 | 0.9 | | 0.9 | | 0.8 |
| N-14C | 761019 | 24.5 | 0.2 | | | | | |
| N-14C | 761023 | 23.0 | 1.8 | | 1.6 | | | |

## APPENDIX B

## T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

| STATION | DATE | TEMP CENT | DO-MG/L 1 FT | DO-MG/L 6 FT | DO-MG/L 11 FT | DO-MG/L 12 FT | DO-MG/L 15 FT | DO-MG/L 16 FT |
|---|---|---|---|---|---|---|---|---|
| SOUTH BASIN | | | | | | | | |
| S-1A | 761018 | 25.0 | 0.4 | 0.3 | | 0.2 | | |
| S-1A | 761019 | 25.0 | 0.2 | 0.1 | | 0.1 | | |
| S-1A | 761020 | 24.0 | 0.2 | 0.1 | | | | |
| S-1A | 761023 | 25.0 | 0.6 | | 0.2 | | | |
| S-1B | 761018 | 25.0 | 0.2 | 0.1 | | 0.1 | | |
| S-1B | 761023 | 25.0 | 1.4 | | 1.1 | | | |
| S-1C | 761018 | 25.0 | 0.4 | 0.2 | | 0.2 | | |
| S-1C | 761023 | 25.0 | 0.2 | | 0.1 | | | |
| S-2A | 761018 | 25.0 | 0.3* | | | | | |
| S-2A | 761018 | 25.0 | 0.3 | 0.2 | | 0.1 | | |
| S-2A | 761019 | 25.0 | 2.2 | 2.3 | | 1.6 | | 1.0 |
| S-2A | 761020 | 24.5 | 6.6 | 6.6 | | 6.6 | | |
| S-2A | 761023 | 25.0 | 0.9 | | 0.2 | | | |
| S-2B | 761018 | 25.0 | 0.4 | 0.2 | | 0.1 | | |
| S-2B | 761023 | 25.0 | 1.4 | | 1.0 | | | |
| S-2C | 761019 | 25.0 | 0.2 | 0.1 | | 0.1 | | |
| S-2C | 761020 | 24.0 | 3.3 | 3.0 | | 2.2 | | |
| S-2C | 761023 | 25.0 | 0.4 | | 0.2 | | | |
| S-3A | 761020 | 25.0 | 0.1 | | | | | |
| S-3A | 761023 | 25.0 | 5.9 | | | | | |
| S-3A | 761023 | 26.0 | | | 1.9 | | | |
| S-3B | 761023 | 26.0 | 1.4 | | 0.5 | | | |
| S-3C | 761020 | 25.5 | 0.4 | 0.5 | | 0.2 | | |
| S-3C | 761023 | 22.5 | 4.3 | | | | | |
| S-3C | 761023 | 25.5 | | | 0.2 | | | |
| S-4A | 761020 | 25.0 | 3.0 | 2.9 | | 2.6 | | |
| S-4A | 761023 | 26.0 | 5.8 | | 2.7 | | | |
| S-4B | 761023 | 26.0 | 6.0 | | 2.1 | | | |
| S-4C | 761023 | 26.0 | 6.1 | | | | | |
| S-4C | 761023 | 25.0 | | | 4.1 | | | |
| S-5A | 761018 | 25.0 | 0.2 | 0.2 | | 0.0 | | |
| S-5A | 761019 | 25.0 | 0.2 | 0.2 | | | | |
| S-5A | 761020 | 25.0 | 0.1 | | | | | |
| S-5A | 761023 | 25.5 | 0.2 | | | | | |
| S-5A | 761023 | 26.0 | | | 0.0 | | | |
| S-5B | 761018 | 25.0 | 0.4 | 0.3 | | 0.2 | | |
| S-5B | 761023 | 26.0 | 0.2 | | | | | |
| S-5B | 761023 | 25.5 | | | 0.0 | | | |
| S-5C | 761018 | 25.0 | 0.8 | 0.8 | | 0.4 | | |
| S-5C | 761019 | 25.0 | 0.3 | 0.1 | | | | |
| S-5C | 761023 | 25.0 | 0.1 | | 0.0 | | | |
| S-6A | 761018 | 26.0 | 0.4* | | | | | |
| S-6A | 761018 | 26.0 | 2.8 | 2.6 | | 2.3 | | 2.3 |
| S-6A | 761019 | 26.0 | 0.8 | 0.6 | | 0.4 | | |
| S-6A | 761020 | 25.0 | 2.6 | 2.5 | | 2.0 | | |
| S-6A | 761023 | 25.5 | 1.1 | | 0.5 | | | |
| S-6B | 761018 | 26.0 | 2.8 | 2.7 | | 2.4 | | 1.6 |
| S-6B | 761023 | 25.5 | 1.8 | | 1.3 | | | |
| S-6C | 761020 | 25.0 | 0.4 | 0.2 | | 0.2 | | |
| S-6C | 761023 | 26.0 | 3.1 | | | | | |
| S-6C | 761023 | 25.5 | | | 2.9 | | | |

## APPENDIX B

## T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

| STATION | DATE | TEMP CENT | DO-MG/L 1 FT | DO-MG/L. 6 FT | DO-MG/L 11 FT | DO-MG/L 12 FT | DO-MG/L 15 FT | DO-MG/L 16 FT |
|---|---|---|---|---|---|---|---|---|
| SOUTH BASIN | | | | | | | | |
| S-7A | 761023 | 25.5 | 0.6 | | | | | |
| S-7A | 761023 | 26.0 | | | 0.3 | | | |
| S-7B | 761023 | 25.5 | 0.4 | | | | | |
| S-7B | 761023 | 26.0 | | | 0.1 | | | |
| S-7C | 761023 | 25.5 | 0.2 | | 0.0 | | | |
| S-8A | 761023 | 25.0 | 5.7 | | | | | |
| S-8A | 761023 | 26.0 | | | 1.2 | | | |
| S-8B | 761023 | 25.0 | 6.1 | | | | | |
| S-8B | 761023 | 26.0 | | | 2.3 | | | |
| S-8C | 761023 | 26.0 | 3.5 | | 3.0 | | | |
| S-11A | 761018 | 23.0 | 5.6 | | | | | |
| S-11A | 761018 | 23.0 | 6.7 | 6.5 | | 6.5 | 6.4 | |
| S-11A | 761019 | 22.5 | 8.2 | 8.1 | | | | |
| S-11A | 761020 | 21.0 | 6.6 | 6.5 | | 6.5 | | |
| S-11A | 761023 | 20.0 | 6.2 | | 6.3 | | | |
| S-11B | 761023 | 20.0 | 6.2 | | 5.9 | | | |
| S-11C | 761023 | 20.0 | 6.6 | | 6.5 | | | |
| S-12A | 761019 | 22.5 | 8.2 | | | | | |
| S-12A | 761020 | 21.0 | 7.0 | 6.8 | | 6.8 | | |
| S-12A | 761023 | 19.5 | 7.0 | | 6.8 | | | |
| S-12B | 761023 | 19.5 | 6.5 | | 6.3 | | | |
| S-12C | 761023 | 20.0 | 6.2 | | | | | |
| S-12C | 761023 | 19.5 | | | 6.2 | | | |
| S-13A | 761019 | 22.0 | 8.2 | 8.0 | | 8.0 | | |
| S-13A | 761020 | 21.0 | 7.4 | 7.5 | | 7.5 | | |
| S-13A | 761023 | 20.0 | 7.8 | | 7.8 | | | |
| S-13B | 761023 | 19.5 | 7.9 | | 7.9 | | | |
| S-13C | 761018 | 23.0 | 4.9 | 4.8 | | 4.6 | 4.6 | |
| S-13C | 761023 | 19.5 | 8.1 | | 7.9 | | | |
| S-14A | 761018 | 23.0 | 3.9 | 3.9 | | 3.8 | 3.8 | |
| S-14A | 761020 | 21.0 | 7.7 | 7.6 | | 7.6 | | |
| S-14A | 761023 | 19.5 | 8.2 | | 8.1 | | | |
| S-14B | 761023 | 19.5 | 7.9 | | 7.7 | | | |
| S-14C | 761019 | 22.5 | 8.2 | | | | | |
| S-14C | 761023 | 19.5 | 7.4 | | 7.3 | | | |

# APPENDIX B

## T.E. MAXSON WTP DISSOLVED OXYGEN CONCENTRATIONS

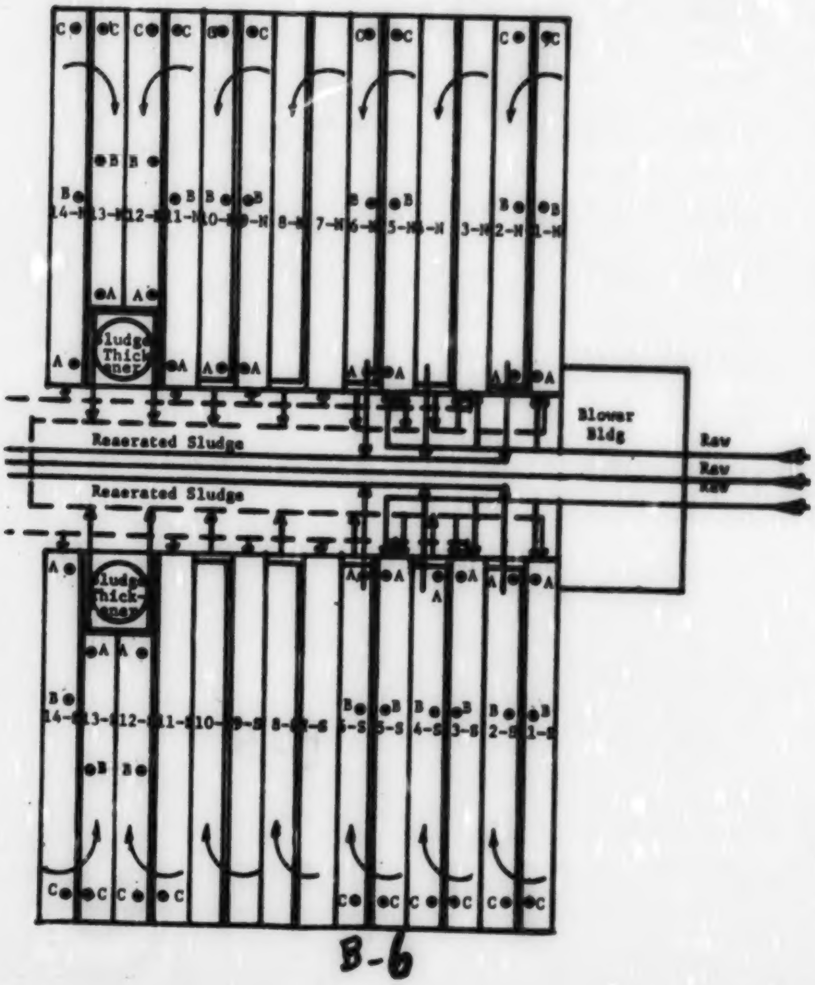
| STATION | DATE | TEMP CENT | DO-MG/L 1 FT | DO-MG/L 6 FT | DO-MG/L 11 FT | DO-MG/L 12 FT | DO-MG/L 15 FT | DO-MG/L 16 FT |
|---|---|---|---|---|---|---|---|---|
| **CLARIFIER** | | | | | | | | |
| C-2N | 761018 | 24.5 | 0.2 | 0.0 | | | | |
| C-2N | 761019 | 25.0 | 0.1 | | | | | |
| C-3N | 761018 | 24.0 | 0.4 | 0.2 | | 0.2 | | |
| C-3N | 761019 | 25.0 | 0.1 | | | | | |
| C-2S | 761018 | 24.5 | 0.4 | 0.2 | | 0.0 | | |
| C-2S | 761019 | 25.0 | 0.1 | | | | | |
| C-3S | 761018 | 24.5 | 0.3 | 0.2 | | 0.0 | | |
| C-3S | 761019 | 25.0 | 0.1 | | | | | |
| C-4S | 761018 | 24.5 | 0.2 | 0.0 | | | | |
| C-4S | 761019 | 25.0 | 0.1 | | | | | |
| **INFLUENT** | | | | | | | | |
| I | 761019 | 24.0 | 0.2 | 0.2 | | | | |
| I | 761020 | 24.0 | 0.2 | | | | | |

* BASIN DO METER READING

TEMPERATURE ARE SAME FOR EACH STATION DEPTHS

DISSOLVED OXYGEN SAMPLE STATION LOCATIONS

T. E. MAXSON WTP


C
B
A
14-N
13-N
12-N
11-N
10-N
9-N
8-N
7-N
6-N
5-N
4-N
3-N
2-N
1-N
Sludge Thickener
Reaerated Sludge
Blower Bldg
Raw
Raw
Raw
Reaerated Sludge
Sludge Thickener
14-S
13-S
12-S
11-S
10-S
9-S
8-S
7-S
6-S
5-S
4-S
3-S
2-S
1-S

# APPENDIX C

## OXYGEN UPTAKE PROCEDURE [1]

A. Apparatus

1. Electronic DO analyzer and bottle probe
2. Magnetic stirrer
3. Standard BOD bottles (3 or more)
4. Three wide mouth sampling containers (approx. 1 liter each)
5. DO titration assembly for instrument calibration
6. Graduated cylinder (250 ml)
7. Adapter for connecting two BOD bottles

B. Procedure

1. Collect samples of return sludge, aerator influent and final clarifier overflow. Aerate the return sludge sample promptly.
2. Mix the return sludge and measure that quantity for addition to a 300 ml BOD bottle that corresponds to the return sludge proportion of the plant aerator, i.e. for a 40% return sludge percentage in the plant the amount added to the test BOD bottle is:

$$\frac{300 \times .4}{1.0 + .4} = \frac{120}{1.4} = 86 \text{ ml}$$

3. Carefully add final clarifier overflow to fill the BOD bottle and to dilute the return sludge to the plant aerator mixed liquor solids concentration.
4. Connect the filled bottle and an empty BOD bottle with the BOD bottle adapter. Invert the combination and shake vigorously

while transferring the contents. Re-invert and shake again while returning the sample to the original test bottle. The sample should now be well mixed and have a high DO.

5. Insert a magnetic stirrer bar and the previously calibrated DO probe. Place on a magnetic stirrer and adjust agitation to maintain a good solids suspension.
6. Read sample temperature and DO at test time t=). Read and record the DO again at 1 minute intervals until at least three consistent readings for the change in DO per minute are obtained ($\Delta$DO/min). Check for the final sample temperature. This approximates sludge activity in terms of oxygen use after stabilization of the sludge during aeration (unfed sludge activity).
7. Repeat steps 2 through 6 on a replicate sample of return sludge that has been diluted with aerator influent (fed mixture) rather than final effluent. This $\Delta$ DO/minute series reflects sludge activity after mixing with the new feed. The test results indicate the degree of sludge stabilization and the effect of the influent waste upon that sludge.

The load factor (LF), a derived figure, is helpful in evaluating sludge activity. It is calculated by dividing the DO/min of fed sludge by the DO/min of the unfed return sludge. The load ratio reflects the conditions at the beginning and end of aeration. Generally, a large

# APPENDIX (Continued)

factor means abundant, acceptable feed under favorable conditions. A small LF means dilute feed, incipient toxicity, or unfavorable conditions. A negative LR indicates that something in the wastewater shocked or poisoned the "bugs".

1/ Taken from "Dissolved Oxygen Testing Procedure," F.J. Ludzack and script for slide tape XT-43 (Dissolved Oxygen Analysis - Activated Sludge Control Testing) prepared by F. J. Ludzack, NERC, Cincinnati.

# APPENDIX D
## GENERAL STUDY METHODS

Methods used to accomplish the stated objective included extensive sampling, physical measurements and daily observations. The WTP influent-effluent stations were sampled for seven consecutive 24-hour periods with ISCO Model 1392-X automatic samplers. Aliquots of sample were pumped at hourly intervals into individual refrigerated glass bottles which were composited proportional to flow at the end of each sampling period. Additional individual hourly influent samples, over three 24-hour periods were analyzed for COD.

Flows were determined from plant totalizers and hourly computer print outs.

All dissolved oxygen levels were determined using the YSI Model 51A dissolved oxygen meter.

An Analytical Measurements Model 30 WP cordless pH recorder was installed at the grit chamber to monitor influent pH through the sampling periods. Temperatures and pH were determined at other stations with thermometer and portable pH meter.

Depth of the secondary clarifier sludge blankets were determined daily using equipment suggested by Alfred W. West, EPA, NFIC, Cincinnati (10).

Sludge activity was determined by the oxygen uptake procedure presented in Appendix C.

A series of standard operational control tests were run daily:

(1) Settleability of mixed liquor suspended solids (MLSS) as determined by the settlometer test;

(2) Percent solids of the mixed liquor and return sludge determined by centrifuge;

(3) Suspended Solids and Volatile Suspended Solids analysis on the aeration basin mixed liquor and return sludge;

(4) Turbidity of each final clarifier effluent.

Visual observations of individual unit processes were recorded.

Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the Environmental Protection Agency.

# APPENDIX E

## INDUSTRIAL DISCHARGERS
## NONCONNAH CREEK BASIN AND PRESIDENTS ISLAND BASIN

### NONCONNAH CREEK BASIN

AAA ALUMINUM
AIR PRODUCTS & CHEM, INC.
ALCO-GRAVURE, INC.
ALLIED MILLS (LAMAR)
ALTON BOXBOARD
ALUMA FORM, INC.
AMERICAN CAN CO.
AMERICAN FABRICATING ENG., INC.
AMERICAN MOLDED PLASTICS
AVIATION MAT'LS, INC.
W.H. BARR & CO., INC.
BEMIS CO., INC.
RUTH BERRY CO.
R.H. BOGLE CO., INC.
BOISE CASCADE
BOND MFG. CO.
BROYLES BAKERY
BRYCE CORP.
BUCKEYE CELLULOSE (S.PLT.)
BURK-HALL PAINT CO.
C.P. INDUSTRY, INC.
C & R CABINET
CARRIER EXCAVATION & FOUND.
CENTRAL SOYA
CHAPMAN CHEMICAL
CHECKS, INC.
CHEMICAL DYNAMICS, INC.
CHICKASAW BROOM MFG. CO.
CHRIS FIELDER CO., INC.
CLEO WRAP, INC.
CELVEPAK CORP.
COLE MANF. CO.
CONE MILLS, INC.
CONLEY FROG & SWITCH
CONSOLIDATED PACKAGING CORP.
COTTONWOOD CONVERTING CORP.
COYNE CYLINDER
CRAFT MACHINE, INC.
CREATIVE MFG. CO., INC.
CROWN ZELLERBACH
CUMMINS MID-SOUTH
DOF FOODS
D & W PLATING
THE DAVIS CO.
DELTA CHEMICAL CO.
DELTA REFINING CO.
DIXICO, INC.
DIXIE LITHO PLATE, INC.
DUNAVANT ENTERPRISES
ELY-WALKER
EZON PRODUCTS
FAMOUS PIES
FIBERFINE OF MEMPHIS
FISCHER STEEL CORP.
FORTIFIBER CORP.
FRITO-LAY
FRUEHAUF CORP.
GANT IND., INC.
GATES LUMBER
GEM, INC.
GENERAL CABLE CORP.
GENERAL METALS
GENERAL PRINTING INK CO.
G.D. GOODFELLOW CO., INC.
J.O. GOSHORN CO., INC.
GOULD, INC.
GRINNELL F. P. SYSTEMS
HANSON ENGRAVING
HARBIN MIX CO., INC.
HIGHS ICE CREAM
HUERNOR WALDORF CORP.
HOLIDAY PRESS
HOLIDAY WOODCRAFT
HUNTER FAN & VENTILATING
HUNT-WESSON FOODS, INC.
ILLINOIS CENTRAL/JOHNSTON YD.
IDEAL CHEMICAL CO.
INDUSTRIAL UNIFORM & LINEN SER.
INMONT CORP.
J & J QUICK MEATS
JIFFY PRINT
JOHN DEERE
JORDAN CO.
W.S. JORDAN SAND & GRAVEL CO.
KEATHLEY'S INC.
KEIFFER PKG. CO.
KELLOGG CO.
KIMCO AUTO PRODUCTS
KING JUICES
KLINKE BROS. ICE CREAM
KRAFT FOODS DIV. OF KRAFTCO
KROGER - FRISCO
LEHMAN ROBERTS
LILLY CO.
MCCLEARY, INC.
MEMPHIS DINETTES, INC.
MEMPHIS FURNITURE CO.
MEMPHIS PLYWOOD CORP.
MEMPHIS SMELTING & REFINING (FORMERLY MEMPHIS LEAD CO.)
MEMPHIS SASH & DOOR
MID-SOUTH REFRIGERATED WHSE.
MID-WEST FARMS
MSU PRESS
J.W. MOORE PRINTING CO., INC.
MOORE & SON
NATIONAL MFG. CO., INC.
NATIONAL STARCH & CHEM. CO.
NORTON MFG. CO.
NYLON NET CO.
ORGILL BROTHERS CO., INC.
OVERHEAD DOOR CO.
PERMANENT RECORDS CO.
PIONEER METAL SPEC.
PLASTIC COLORS UNLTD.
PLASTIC PIGMENTS (J & C COLOR IND.)
POLYMER INDUSTRIES, INC.
POLYPRODUCTS, INC.
PRECISION THERMOPLASTICS CORP. (THERMOPLASTICS CORP.)
PRO-SERV
QUALITY IND. UNIFORM SERV.
RADEFIELDS BAKERIES
RAINBO PHOTO SERVICE
RALSTON PURINA (MEAL DIV.)
RALSTON PURINA (PROTEIN DIV.)
REXHAM CORP.
RICHARDS MFG. CO.
RIVIANA FOODS, INC.
ST. JOE PAPER CO.
SCHLITZ BREWING CO.
SHANNON BROTHERS LUMBER CO.
SHASTA BEVERAGE CO.
D.G. SHELTER PRODUCTS
SHULTON, INC.
SINCLAIR & VALENTINE
J.M. SMUCKER CO.
SOUTHEAST INK & LACQUER
SOUTHERN COTTON OIL
SOUTHERN FABRICATORS, INC.
SOUTHERN LAMINATING
SOUTHERN METAL (PLAST. DIV.)
SOUTHERN PAPER PROD., INC.
SOUTHERN WOOD PARTS, INC.
SPECIALITIES, INC.
STANDARD BRAKE SHOE & FOUND.
SPECTRUM CEREMICS
J. STRICKLAND & CO.
STUCK, INC.
STYRO-FLORAL PRODUCTS, INC.
TENN. FABRICATING CO.
TENSION ENVELOPE CO.
THORNTON'S FLAV-O-RICH DONUTS
TRI-STATE COMMUNICATIONS
TRI-STATE IND. (GLASGOW GRAVEL)
UNIFORM CORP.
UNITED PAINT CO.
USS AGRI. CHEM. DIV.
VALLEY PRODUCTS CO.
VICO DIESEL
WAR BROOKS, INC.
WATKINS PRODUCTS, INC.
WELLS LAMONT
WESTERN PAPER
WHITE STONE CO.

# APPENDIX E (CONT'D)

## INDUSTRIAL DISCHARGERS
## NONCONNAH CREEK BASIN AND PRESIDENTS ISLAND BASIN

### PRESIDENTS ISLAND BASIN

AMERICO INC.
ANDERSON CHEMICAL CO.
ARMCO STEEL CORP.
ARMOUR FOOD CO.
ARROW TRAILERS, INC.
BELL-MEMPHIS, INC.
BENGAL WIRE
BLOCK DRUG CO.
CARGILL, INC.
CARGILL, INC. WET CORN MILL PLANT
CBI NUCLEAR
CHEMICAL SPECIALTIES
CONSTRUCTION PRECAST CONCRETE
DIXIE MILLS COMPANY
DIXIE PORTLAND FLOUR MILLS, INC.
FAITH MEMPHIS PLATING CO.
FEATHERLITE CORPORATION
GENERAL ELEC. MPHS. LAMP PLANT
HENDER'S BOILER & TANK CO.
LILLY INDUSTRIAL COATING, INC.
MEMPHIS BUTCHERS
MEMPHIS SHEET METAL WORKS, INC.
MEMPHIS WIRE & IRON WORKS
MID-AMERICA INDUSTRIES, INC.
MID-SOUTH METAL TREATING
MID-SOUTH PLATING CO.
MILLER TRANSPORTERS, INC.
NAT BURING
NATIONAL ALFALFA DEHY & MILLING CO.
NATIONAL BEDDING & FURNITURE
NATIONAL DISTILLERS PRODUCTS
PIPER STEEL PROCESSING
PORTEC, INC.
PRIMARY STEEL, INC.
REES MEMPHIS, INC.
RICHARDSON INK CO.
ROYAL CROWN BOTTLING CO.
SHELTON TRUCK & TRAILER, INC.
SPEAS CO.
SYTHAX CORP.
THERMO-PAK BOILERS, INC.
TROJAN LUGGAGE CO.
UNARCO COMMERCIAL PRODUCTS
WESTERN TAR PRODUCTS CORP.
WILLIAMS MACHINE WORKS

*U.S.GOVERNMENT PRINTING OFFICE: 1977-742-381/4351 REGION NO. 4